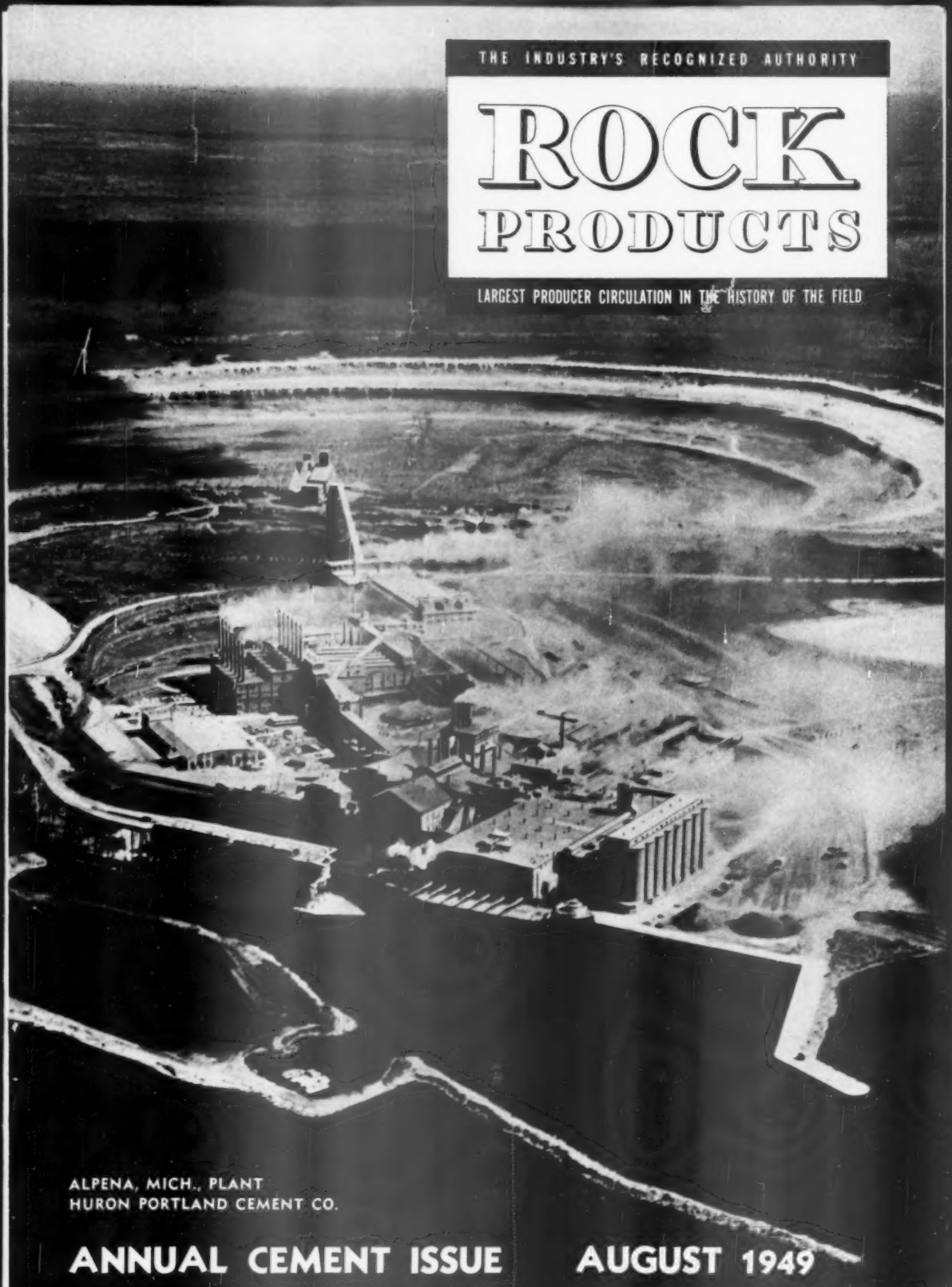
THE INDUSTRY'S RECOGNIZED AUTHORITY

ROCK PRODUCTS

LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD



ALPENA, MICH., PLANT
HURON PORTLAND CEMENT CO.

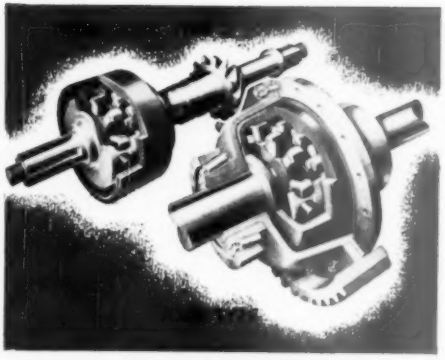
ANNUAL CEMENT ISSUE **AUGUST 1949**

NO PLACE FOR...
"STICK-IN-THE-MUDS"

◆ Trucks that stick in the mud are an expensive proposition when you're trying to get the big loads out on stepped-up schedules. When they bog down, profits go right down with them.

Masters of the mire, Mack six-wheelers keep going through slippery mud and sand because they have the benefit of Mack's exclusive Power Divider. This unique device divides torque between the two bogie axles and between the four driving wheels. Torque is delivered proportionately to wheels having the most traction, thus eliminating dissipation of power in useless slippage and wasteful wheel spinning.

If "stick-in-the-muds" are holding you back, it will pay you to investigate the profit possibilities of dependable, hard-working Mack trucks. Write or call your nearest Mack branch or dealer for the complete story on what Macks can do for you.

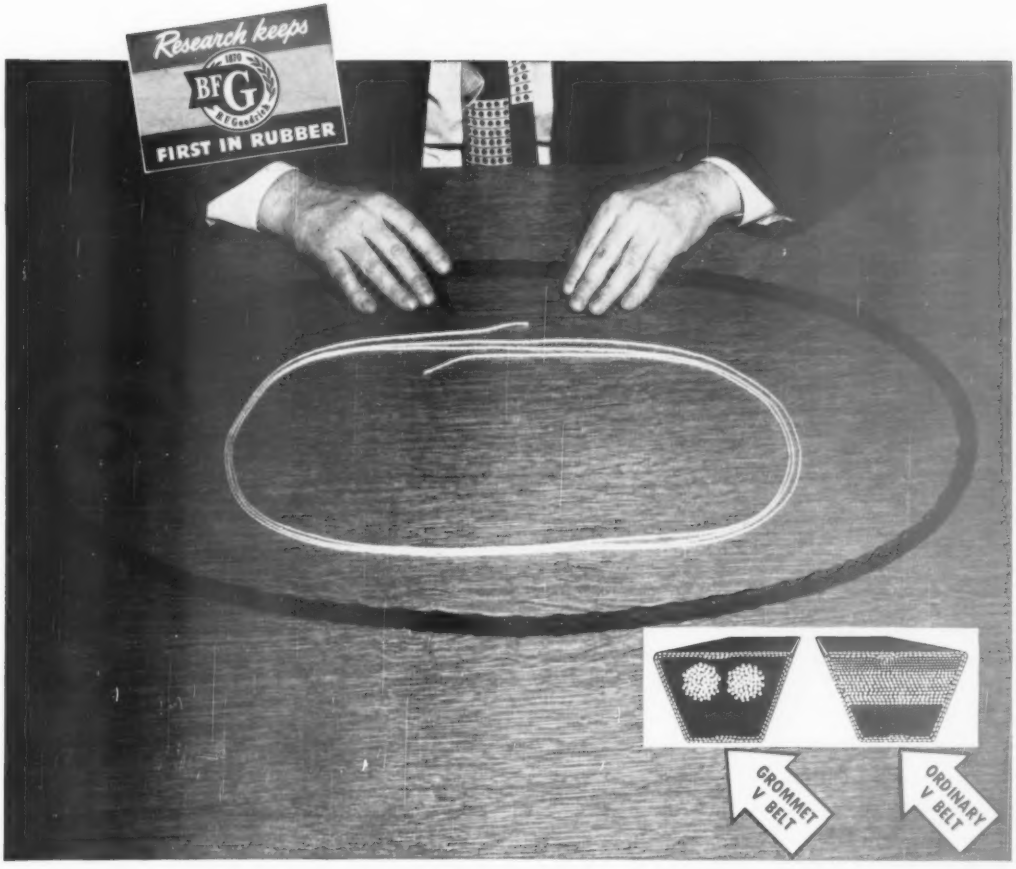


it's a job for *MACK TRUCKS*

IT'S PART OF THE LANGUAGE

Built Like a **Mack** *Truck*

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Limited.



Endless grommet V belts end most cord failures

B. F. Goodrich grommet V belts cut costs 20 to 50%

THAT large loop of cord is a grommet, made by winding heavy cord on itself to form an endless loop. It is one of the twin grommets that make up the cord section of a B. F. Goodrich grommet V belt. The small loop, with the two ends showing, is one of the cords that make up the cord section of an ordinary V belt. Most of the failures in ordinary V belts occur in the region where cord ends overlap. Because the cord in a grommet V belt is in effect endless, such failures are eliminated.

Longer life—Elimination of overlapping cord ends, helps grommet V belts last 20 to 50% longer than ordinary V belts. *Concentrated* cord strength is another reason—all the cord in a B. F. Goodrich grommet V belt is in the twin grommets, each of which is placed close to a driving face of the pulley. This insures maximum power delivery, even load distribution, full use of all cord strength.

Better grip—Because a grommet V belt has no stiff, inflexible overlap section, every part of the belt is equally flexible, gives uniform grip, reduces slip. Size for size, grommet V belts give you ⅓ more gripping power, pull heavier loads, with a higher safety factor. Less heat is generated, cord and adhesion failures are reduced.

No other V belt is a grommet V belt! Twin grommet construction is an exclusive B. F. Goodrich feature—no other V belt has it. Grommet construction is protected by U. S. Patent No. 2,233,294. (Now available in D and E sizes only.) To make sure you get genuine grommet V belts, see your local B. F. Goodrich distributor. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Grommet V Belts BY
B.F. Goodrich

AUGUST, 1949

ROCK PRODUCTS

THE INDUSTRY'S RECOGNIZED AUTHORITY

VOL. 52, No. 8

Bror Nordberg
Editor

Nathan C. Rockwood
Editorial Consultant

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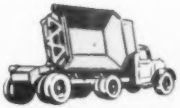

Type TRB • 14 to 20 tons

Type TL • 20 to 30 tons

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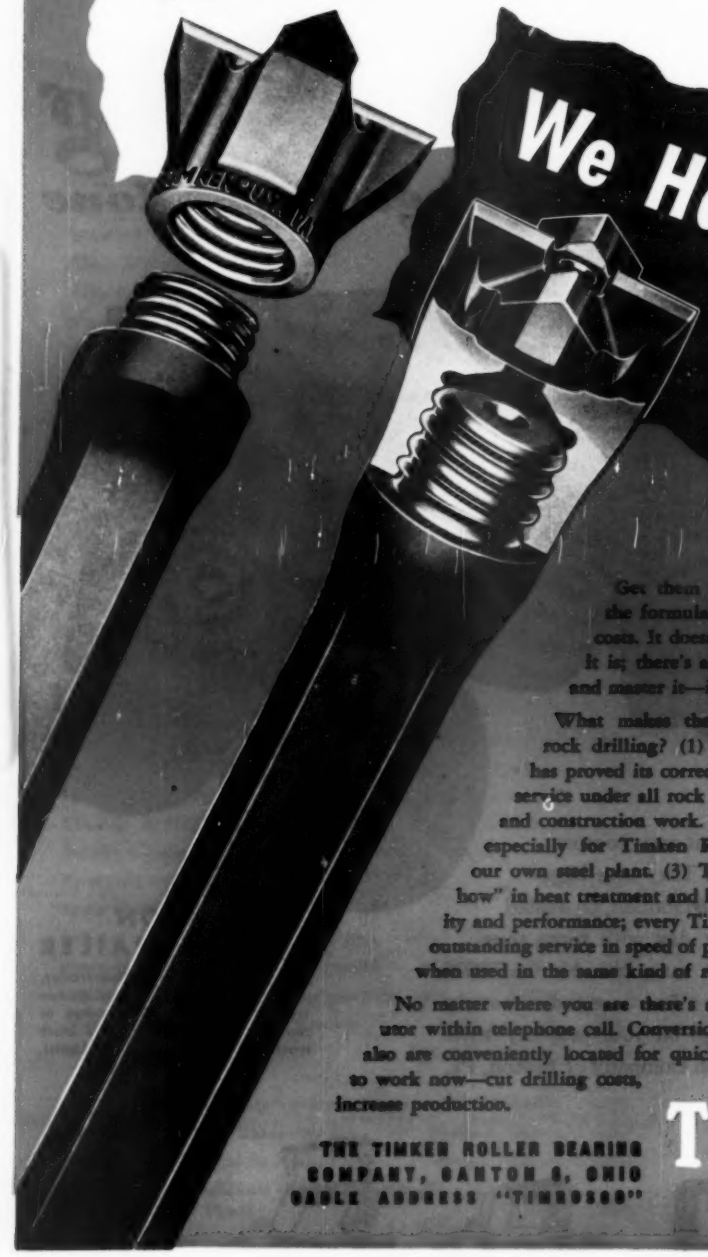

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ROCK BITS

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only the best for the heart of the job
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PROFIT
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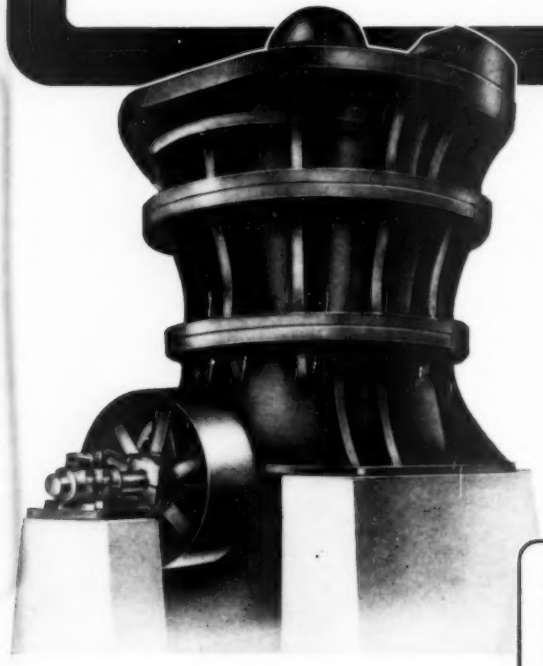
Convertible for any Mining Material Handling or Excavation Problem

WHEREVER CEMENT IS PROCESSED PROFITABLY... YOU'LL FIND TRAYLOR EQUIPMENT ON THE JOB



For Primary Crushing in huge quantities, a favorite item of equipment is the Traylor Bulldog Gyratory Crusher like this 54" model which Traylor built for a cement plant in Montreal, P.Q. and one in Great Britain.

On six continents, successful cement processing and Traylor equipment are synonymous. In addition to giving operators "down under" a lift and brightening the lot of producers on the "dark continent", Traylor equipment is turning out bigger profits for dozens of cement manufacturers right here in America.

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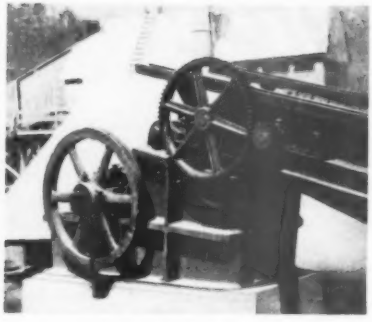
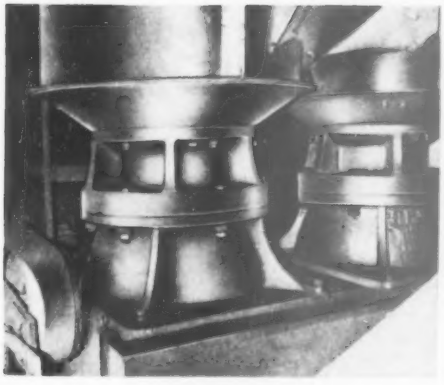
Traylor CEMENT

A "TRAYLOR" LEADS

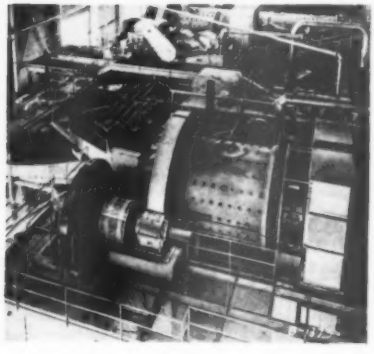
Here are a few examples



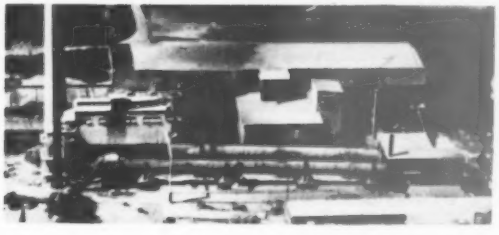
Lesser volumes can often be most profitably crushed with a Traylor Jaw Crusher such as the Type H shown here with a Traylor All Steel Apron Feeder to provide absolute feed control.



For Reduction Crushing, the Traylor TY, with its exclusive bell head and curved concaves, has an extremely favorable output-to-horsepower ratio. This is one of a pair employed in a California cement plant.

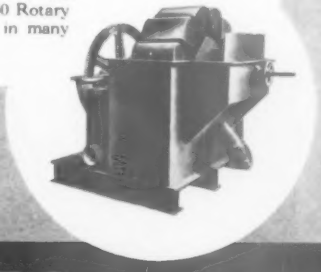


Traylor Ball Mills were installed for both raw and finished grinding when this plant was built in 1948 at Portland, Colorado. This company has a total of 27 Ball Mills in operation at plants in Colorado, Alabama and Utah.



This picture shows a 9'6" x 250' Traylor Rotary Kiln and Tube Cooler operating in a modern cement plant at Okay, Arkansas. A new plant built by this Company includes four 10' x 400' Traylor Rotary Kilns.

Traylor Slurry Feeders control the supply of raw materials to 80 Rotary Kilns in wet-process plants in many states and foreign countries.



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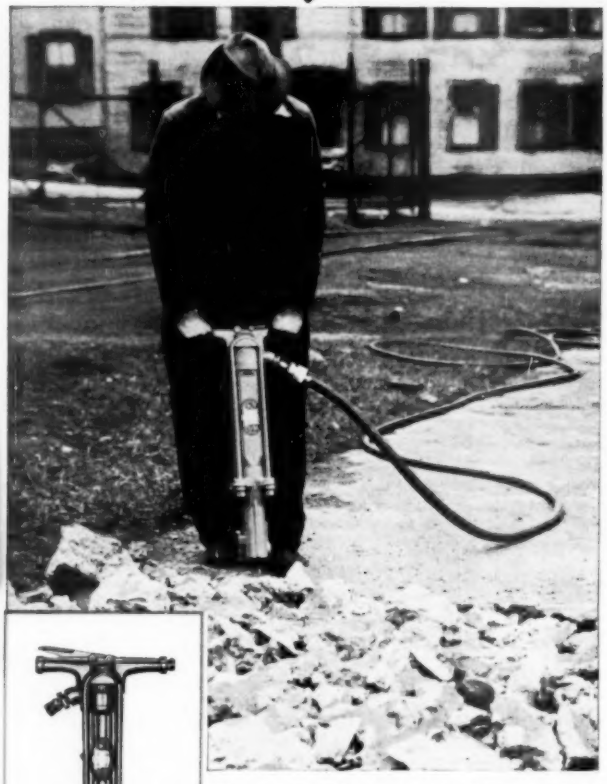
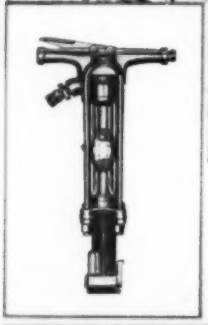
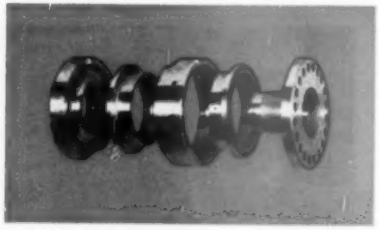




Above: the Joy K-81 Paving Breaker is a rugged tool capable of maximum output on heavy-duty work.

Left: the K-61 Paving Breaker, a powerful, easily-operated tool for all lighter demolition jobs.

JOY "Silver Streak" Paving Breakers can show you real time and cost-saving advantages. They're designed to deliver maximum piston blow, yet with a permanent "cushion" that results in smoother operation—less jarring and operator fatigue—less maintenance and replacement cost. What's more, they're cadmium-plated inside and out—an exclusive JOY feature which makes "running-in" easier and quicker, and protects against deterioration from rusting. ● Write for a bulletin, and ask for an actual demonstration—let us *prove* the superiority of JOY Paving Breakers right on your job.



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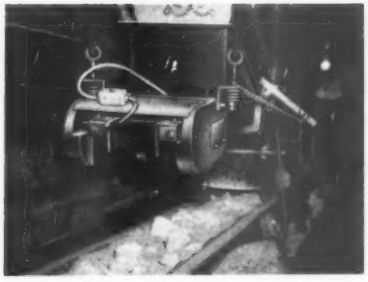
Feeding Rock to Crusher



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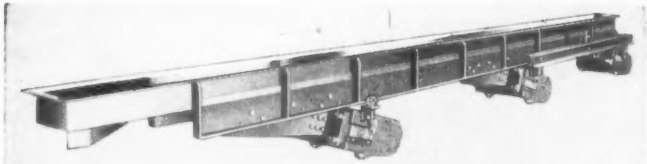

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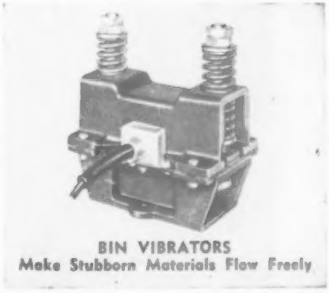

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Make Stubborn Materials Flow Freely

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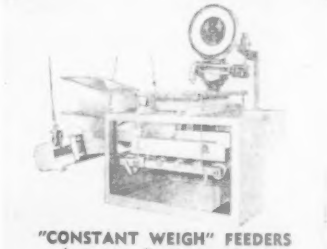

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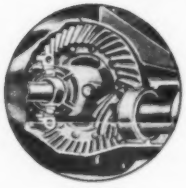
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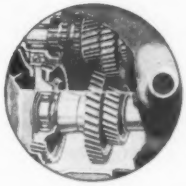
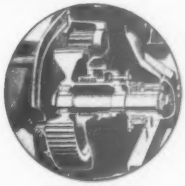

HELICAL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  Only one gear lubricant to handle!
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- **GREATER OPERATOR COMFORT**—roomy platform, comfortable seat, easy to handle.
- **HYDRAULIC BLADE LIFT** — fast, positive, trouble-free; only two control levers.
- **HANDY CONTROLS** — blade angle set from platform; throttle, shift lever, starter, conveniently located next to seat.

Upper half of cab quickly lifted off or replaced.

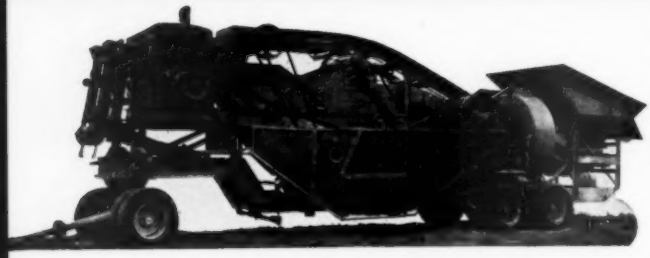
Scarifier location provides extra down pressure and allows controlled steering.

Watch for **D-DAY** At Your Allis-Chalmers Dealer

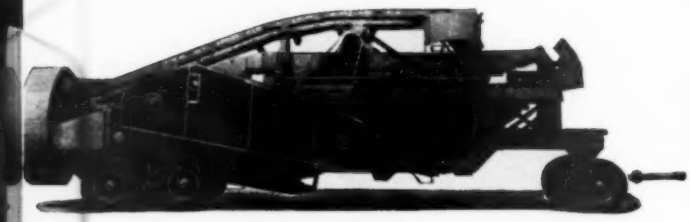
SPECIAL ATTACHMENTS

- Hydraulically Controlled Scarifier
- Hydraulic Loader
- All-View Cab
- Snowplow
- Various Other Accessories

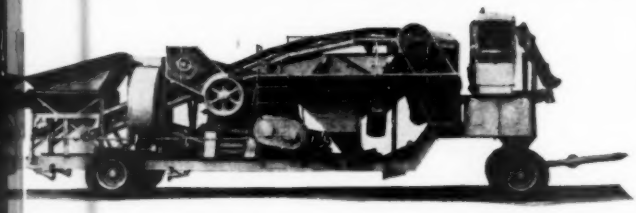
Here's a complete line of portable plants that will meet your every requirement



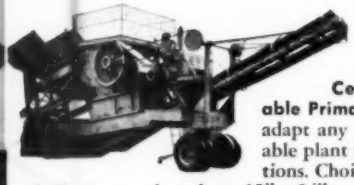
The Cedarapids Junior Tandem is one of the most popular portable crushing and screening plants because it will handle most aggregate producing jobs. The 36″ x 10′ horizontal vibrating screen assures greater capacity and the higher efficiency and closer grading needed for meeting the most exacting specifications. 10″ x 24″ or 10″ x 36″ roller bearing jaw crusher and 24″ x 16″ roller bearing roll crusher provide plenty of capacity for jobs requiring an unusually high percentage of crushing. Operators report production of 110 tons per hour—and more—crushing to ⅝″ with 75% crushing.



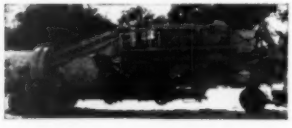
The Cedarapids Master Tandem is the ideal big portable plant for big jobs. It contains all the features that mean big capacity, trouble-free operation and low cost. 10″ x 36″ roller bearing jaw crusher, 40″ x 22″ roller bearing roll crusher and 4′ x 12′ horizontal, double deck vibrating screen assure smooth crushing and screening operations for every pit condition. V-belt and universal drives eliminate troublesome chains and sprockets. No lost time for setting up and taking down between jobs. Production of 150 tons an hour is easy for a Master Tandem.



The Cedarapids Pitmaster is the smallest portable tandem plant in the Iowa line. Every feature is designed and built for low operating and maintenance costs as well as exceptionally low first cost. 10″ x 16″ roller bearing jaw crusher, 16″ x 16″ roller bearing roll crusher, 30″ x 9′5″ horizontal double deck vibrating screen assure production of more than 50 tons per hour under average conditions.

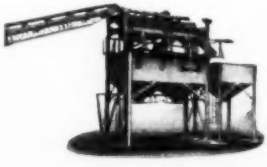


Cedarapids Portable Primary Crushers will adapt any Cedarapids portable plant for quarry operations. Choice of five sizes of single jaw crushers from 15″ x 24″ to 32″ x 40″ and an 18″ x 36″ twin jaw crusher.



Cedarapids Secondary Units are similar to the portable tandem plants but use only one crusher, either a roll, cone, twin jaw or hammermill. Choice of sizes to fit your requirements. Units with any of the first three types of crushers are complete gravel plants but when used with primary or scalping unit will handle crushed stone too. The hammermill secondary will produce agricultural lime or roadstone or a percentage of both.

Cedarapids Scalping Units consist of a single jaw or twin jaw crusher, horizontal, double-deck vibrating screen with conveyors, all mounted on pneumatic tired trucks. May be used for primary crushing when oversize is not too large, or to follow a portable primary in a quarry. Choice of five sizes.



Cedarapids Wet or Dry Screening Units are made up of a two-compartment, welded steel bin with a Cedarapids horizontal double-deck vibrating screen mounted on top. Spray bars can be added for washed aggregate. Choice of 40, 50 or 60 cu. yd. sizes.

Cedarapids

Built by IOWA

The IOWA LINE of Material Handling Equipment includes:

• ROCK AND GRAVEL CRUSHERS • BELT CONVEYORS • STEEL BINS • BUCKET ELEVATORS • VIBRATOR AND REVOLVING SCREENS • STRAIGHT LINE ROCK AND GRAVEL PLANTS • DUMPERS—TRAILERS • PORTABLE POWER CONVEYORS • PORTABLE STONE PLANTS • PORTABLE GRAVEL PLANTS • REDUCTION CRUSHERS • BATCH TYPE ASPHALT PLANTS • MANHOLE CURBS • DRAG SCRAPER TANKS • WASHING PLANTS • SOIL COMPACTION LOOPS • STEEL TRUCKS AND TRAILERS • KUBIT IMPACT BREAKERS • See Your Cedarapids Salesman For Full Details

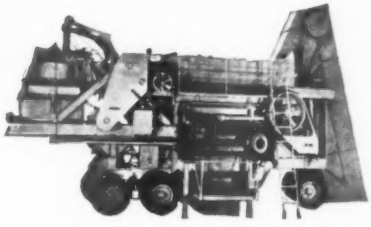
for low cost construction

Left

Cedarapids Model "E", all-electric, batch type bituminous mixing plant is completely portable and yet will handle 2000, 3000 or 4000 lbs. per batch. Will handle hot or cold mixes. Also offered in 2000, 3000 and 4000-lb. capacities with gasoline or diesel power and with or without wheel equipment.

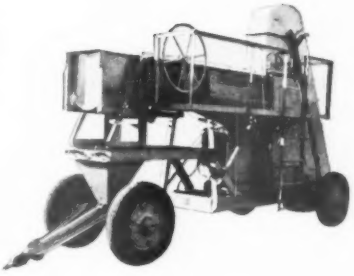
Above

The Cedarapids Model "A" is a knock-down type, 1000-lb. batch bituminous mixing plant built to handle medium sized black top jobs at a profit. 2′ x 6′ Cedarapids-Symons screen, 1000-lb. capacity pug mill, 4′ x 16′ drier, batcher and elevators are perfectly balanced to make a smooth, reliable plant.



Right

Cedarapids Model "FA" is a super-portable batch-type bituminous mixing plant that you can take to widely scattered jobs and set it up for operation in a very few hours. 25 cu. ft. per batch assures big capacity. Pug mill discharges directly into truck. Finger-tip pneumatic controls on ground level operator's platform. Gasoline, diesel or electric power.

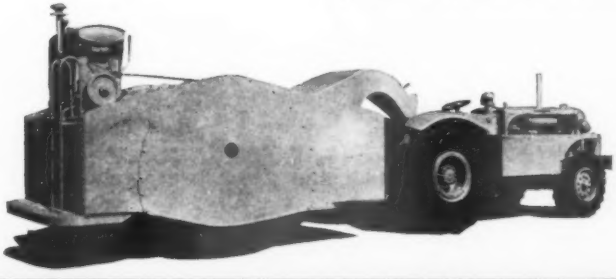


Right

The Cedarapids Patchmaster is the handiest, most portable, low-cost volumetric measuring type bituminous mixing plant for small or medium sized jobs requiring 25 to 30 tons per hour. Ground-level charging hopper and truck-high pug mill discharge simplify operation. May be set up as permanent plant or kept on wheels for easy portability.

Right

The Cedarapids Master Mixer is a two unit, continuous mix type bituminous mixing plant with a capacity of 100 to 150 tons per hour. Mixing unit consists of single shaft pug mill, bitumen pump, elevator and power unit. Gradation unit has 42″ x 10′ Cedarapids-Symons screen, three compartment bin, feeder and elevator.



Left

The Cedarapids Compactor is the answer to your compaction problems whether compacting highway subgrades and bases, airport runways or dam fills, stabilizing soil cement or soil and graded aggregate. It combines a heavy rubber-tired roller with a vibrating mechanism. Offered in 25,000 and 60,000 lb. models.

IOWA MANUFACTURING COMPANY

Cedar Rapids, Iowa, U.S.A.

Modernize ~~YOUR KILN FIRING AND~~

VISUAL CONTROL

Complete Operating Picture of Raymond BOWL MILL

All controls centralized on panel board including Temperature, Feed Rate, Static Pressure, Coal Air Mixture, Amperage and Operating Switches.

You can make your kiln firing operations efficient, uniform and automatic by the use of the Raymond Bowl Mill. Well over a thousand installations have demonstrated the superiority of this modern direct firing unit.

•

The Bowl Mill maintains the proper coal-air ratio and volume for maximum combustion efficiency at all loads. The central control system enables one operator to supervise several mills as easily as a single unit. Your kiln requirements are fully met by the flexibility of the Bowl Mill, and the operation is readily adjusted to variations in size, grindability and moisture content of the coal.

•

High moisture coals can be handled in the Bowl Mill. Drying and grinding are accomplished simultaneously and no separate dryers are necessary. The coal is delivered to the kilns uniformly pulverized and thoroughly dried to insure rapid burning.

•

The Raymond Bowl Mill gives you consistent economies in operation, maintenance and supervision. You will find it to be an important factor in lowering cement production costs.

RAYMOND BOWL MILLS are built in several sizes to meet the capacity requirements of small or large rotary kilns.

BOWL MILL

Raymond engineers will be glad to advise you on special grinding or separating problems.

CEMENT CLASSIFYING OPERATIONS

WHIZZER SEPARATION

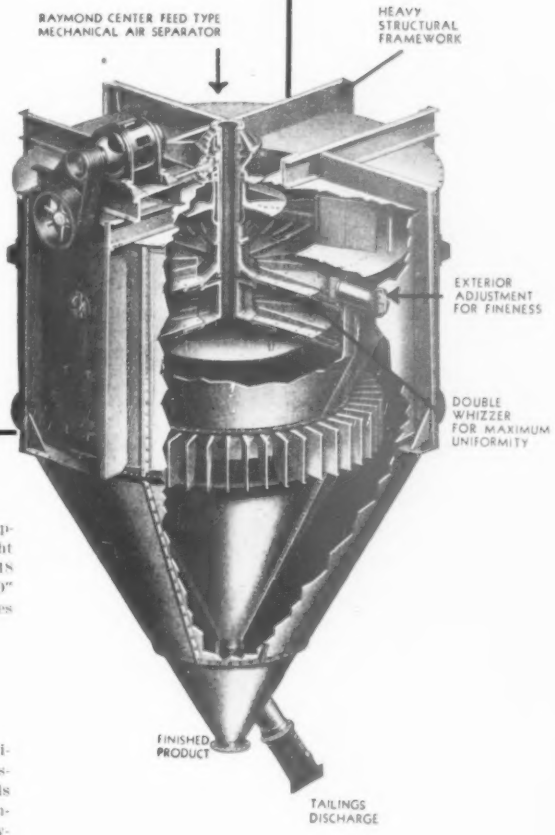
The Raymond Mechanical Air Separator with *double whizzer* is the modern type unit for cement classification, and it will very definitely increase output when used in closed circuit operations in combination with your grinding mills.

•

The whizzer principle of separation insures uniformity of the finished product and clean tailings. With the mill adjusted for the range of fineness desired, you can control the specific surface area of the cement, so as to produce the standard grades or the high early strength cements.

•

The Raymond Separator, with either the single or double whizzer, is highly efficient in classifying many other materials . . . limestone, gypsum, chemicals, and many special materials and manufactured products.



Range of Sizes

Raymond Mechanical Air Separators are built in eight standard sizes from 4 ft. to 18 ft. in diameter, also in the 20" size shown for small capacities or laboratory use.

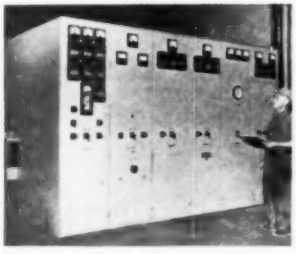
Laboratory Air Separator

This is a 10-inch diameter unit for classifying a few pounds at a time, as in running tests on powdered materials.

COMBUSTION ENGINEERING - SUPERHEATER, INC.
RAYMOND PULVERIZER DIVISION
1307 North Branch Street Chicago 22, Illinois
District Offices: Room No. 612 – 200 Madison Ave., New York 16
San Fernando Bldg., Los Angeles 13, Cal.

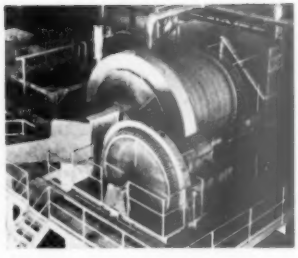
SINCE 1887

1 In the new plant practically all the electric equipment was supplied and co-ordinated by General Electric. Photo shows (inside circle) the G-E outdoor package substation which steps down incoming power from 69,000 to 4160 volts for distribution to five unit substations located at plant load centers. Complete and ready to install, G-E package substations cut installation time and costs, help get production going sooner.



2 The old power system is interconnected with the new purchased power system by means of this 2400-volt, 5000-kva G-E Metal-Clad switchgear. Containing adequate interrupting capacity for short circuit protection, these G-E units are completely metal-enclosed for personnel safety.

3 Here is one of several G-E control stations, at which all related processes of a given department are closely co-ordinated by one operator. Combining indicating instruments and signal lights with pushbutton stations and selector switches, they permit efficient use of manpower.



4 Driving this primary wet ball mill (capacity 235 barrels per hour) is a 500-hp, 4160-volt G-E synchronous motor. Meeting the highest standards of performance, G-E synchronous motors are extensively used for maintaining exact speeds and for improving power factor in many cement plants.

You can put your confidence in—

GENERAL ELECTRIC

658—1

CO-ORDINATED ELECTRICAL SYSTEM PAYS OFF!

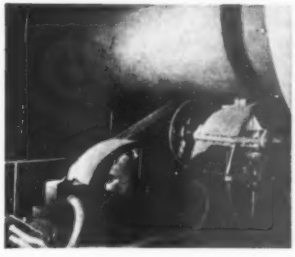
Ideal's new Portland cement plant uses General Electric co-ordinated drives throughout—from primary crushers to packing conveyors—for operating economy.

At the end of their new plant's first year of successful operation, the management of Ideal Cement Company at Portland, Colorado, is well pleased with their General Electric "packaged" electrical system.

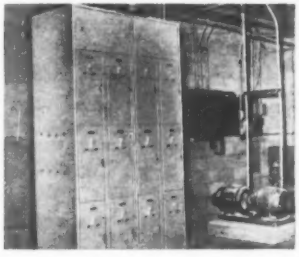
Practically all the components in this system were supplied by General Electric, a company which manufactures *all* the electrical components you require.

G-E application engineers familiar with the problems of the cement industry, and assisted by specialists in particular product lines, carefully selected, co-ordinated, and installed the components as a system—complete and ready to go!

Whether you plan a complete new plant, or the modernization of an existing one, you'll save time and money by consulting your G-E representative first. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



5 This 125-hp, 440-volt G-E motor drives one of the plant's two rotary kilns, each 400 feet long. Built to require minimum maintenance, these motors are not affected by the heat of the kiln. Other G-E induction motors in this plant operate conveyors, pumps, fans and crushers.

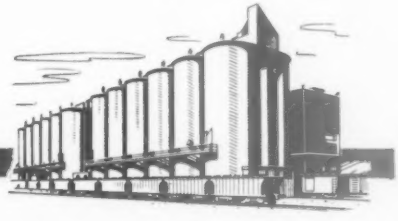


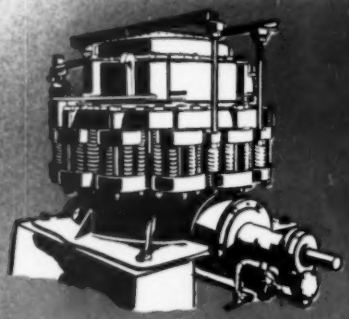
6 Controlling a number of 440-volt G-E motors in the new crushing plant is the G-E Cabinetrol* shown. Compact and factory-assembled, it provides conveniently centralized low-voltage motor controls. Its rigid steel enclosure promotes personnel safety, minimizes disturbances due to dust.

*Reg. U. S. Pat. Off.

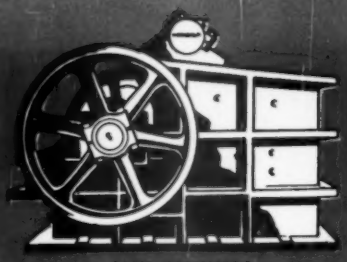
7 This G-E Limitamp control lineup contains starters for 4 G-E 4160-volt synchronous motors, two rated at 1000 hp, two at 500 hp. Combining high-voltage motor control with built-in short-circuit protection, these controllers will protect their connected drive up to ¼-million kva fault level.

Everything you need
to cut rock product costs
. . . electrically!





SECOND AND THIRD STAGE CRUSHERS



JAW CRUSHERS

GYRATORY CRUSHERS

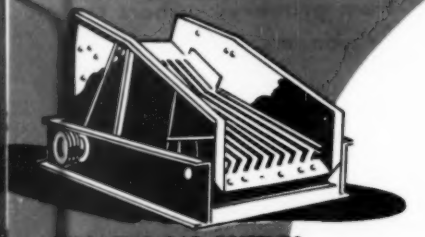
The Cement Industry turns to

NORDBERG

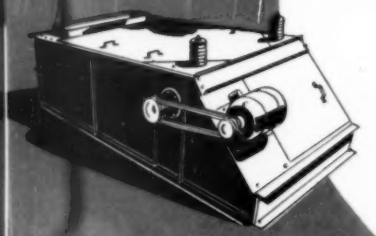
FROM primary crushing of limestone direct from the quarry, through second and third stage crushing, screening, raw grinding, calcining and finish grinding, cement companies all over the world are using Nordberg equipment.

The Nordberg complete line of equipment includes Gyratory and Jaw Crushers for primary crushing; Symons Cone Crushers for second and third stage crushing; Vibrating Bar Grizzlies, Symons Rod Deck Screens and Horizontal Vibrating Screens for sizing; Rotary Kilns; and a complete line of Ball, Tube, and Compartment Grinding Mills. For dependable, low cost power, the complete line of Nordberg Diesels will provide the solution to your power problem.

Write for literature on the equipment you need.



VIBRATING BAR GRIZZLIES



ROD DECK SCREENS

NORDBERG MFG. CO.

MILWAUKEE 7, WISCONSIN

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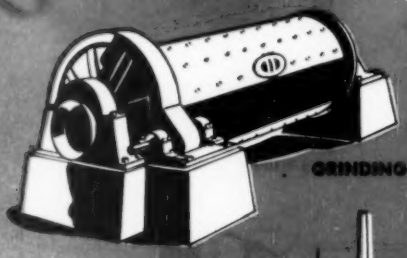
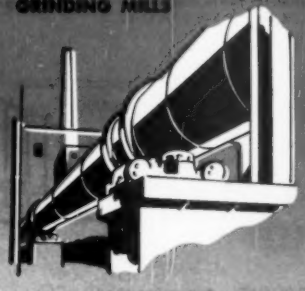
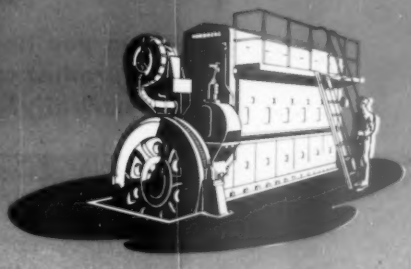


GRINDING MILLS



ROTARY KILNS



DIESEL ENGINES

BIG NEWS!

A new booklet gives you

"Facts you should know about

HARDFACING ALLOYS"

Send for your free copy, TODAY!

This NEW, FREE booklet by Airco gives you authentic, understandable information for combating wear — caused by abrasion, impact, heat and corrosion.

Here, you will get facts essential for increasing the service life of *new* parts, and restoring *worn* parts for additional service. In part, this definitive, profusely illustrated booklet gives you:

- **A handy, easy-to-understand guide for selecting the proper alloy for the proper wear retarding job.**
- **A Hardness Conversion Table.**
- **A Preheating Chart.**
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If you are interested in increasing the service life of your equipment from 2 to 25 times, fill in and mail the coupon below for a copy of this NEW booklet. Send it to our nearest office or authorized dealer. On West Coast: Air Reduction Pacific Company. Represented Internationally by Airco Corporation (International).

ALSO — FOR ONLY $2.95 — YOU CAN GET A TRIAL ASSORTMENT OF AIRCO'S NEW LINE OF HARDFACING ALLOYS . . . A SPECIAL OFFER, AVAILABLE FOR A LIMITED TIME ONLY.

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☐ **Send me a copy of Airco's New Hardfacing booklet — at NO cost to me.**

☐ **Here is my check for $2.95 — send me the special package of Airco's Hardfacing Alloys.**

Firm_____

Signed By_____

Address_____

City & State_____

Ingersoll-Rand

COMPLETELY MANEUVERABLE!

WAGON DRILL

POWER

Here's a double-barrelled power combination that can't be beat for fast, economical blast hole drilling—the new Thor Model 104 4" Drifter, teamed up with a reversible 5 Horse Power rotary air motor chain-driving the Drifter on the versatile Thor wagon mount. Abundant POWER for pulling long drill steels for controlled feeding in any rock formation . . . for full line blowing of deep holes. Here's POWER you'll want to *see* in actual operation on the job.

CONTROL

Here's the easiest to operate wagon drill in the field! Latch-type lock on steel centralizer simplifies hole starting. . Hammer, Blow and Travel controls grouped on mast. Infinitely variable feed control. Contact your Thor distributor for demonstration or write for Wagon Drill Circular 1014.

INDEPENDENT PNEUMATIC TOOL COMPANY

Aurora, Illinois

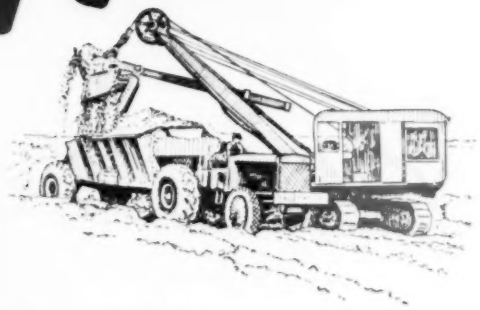
Export Division, 330 West 42nd Street, New York 8, N.Y.

Birmingham Boston Buffalo Chicago Cincinnati Cleveland Denver Detroit Houston
Los Angeles Milwaukee New York Philadelphia Pittsburgh St. Louis St. Paul
Salt Lake City Seattle San Francisco Toronto, Canada Sao Paulo, Brazil London, England

Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

Amsco Dipper Teeth



WESTERN POINT
(Patented)

A tough, long-wearing, reversible tooth for all types of digging operations. Its vertical-wedge fastening system insures quick, easy removal and replacement.

WHISLER POINT
(Patented)

For exceptionally hard service. Widely used on large dippers in mining ore and stripping coal. The wedge and C-clamp in the assembly serve to force the "crotch" of the tooth tight against the dipper lip and insure a snug fit between the tooth and the base.

* * *

In addition to the above, Amsco also manufactures other dipper teeth in a wide range of designs for any kind of service. For details, see Amsco Bulletin 547-DS.

To avoid loose Tooth Trouble

Poorly fitting dipper teeth can't last long. Any play in tooth fit means rapid wear and possible breakage of the tooth base. So specify Amsco when ordering replacement teeth. You can always be sure of a correct fit; every dipper tooth produced by Amsco is checked on a master base.

Made of tough austenitic manganese steel, Amsco dipper teeth work harden radically under heavy impact and develop a plowshare polish which greatly lengthens service life. This hard, shiny surface is self-renewing during the entire life of the part.

Other Amsco products are: Welded-type, renewable lip, and Missabe dippers; dipper parts; crawler shoes, rollers, treads and tumblers; dragline buckets and parts; pulling chains; and Amsco welding products for hardfacing and repair.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo. Offices in principal cities. In Canada: Joliette Steel Limited, Joliette, Que.

1 UNIVERSAL QUARRY PLANT REPLACES 2 SINGLE-UNIT PLANTS

ANOTHER UNIVERSAL FIRST
THE 293-QH LIMEROK PLANT

For Aglime and Roadrock. A two-stage plant with jaw crusher primary and hammermill secondary. Designed for 100% crushing. Produces aglime or roadrock separately or simultaneously in profit-making capacities for agricultural use, or road and concrete construction. Engineered with field proven Universal features. Capacities: Aglime—up to 50 t.p.h. Roadrock—minus 1" up to 75 t.p.h. Write for Form 293-QH and complete details.

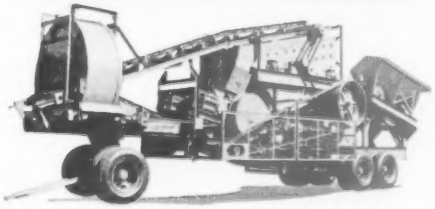
DOUBLE-UNIT PERFORMANCE AT LOWER COST

- LOWER INITIAL COST
- LOWER OPERATING COST
- LOWER MOVING COST
- LOWER MAINTENANCE COST

Universal combines both primary and secondary crushing operations on a single truck to give double-unit performance at lower cost. "Stream-Flo" engineering results in a complete crushing, screening and loading plant in one compact single unit. You get capacity for those large contracts, portability to handle smaller jobs profitably, and save substantially on original investment.

● *Before you invest in either portable or stationary equipment for rock, gravel, or aglime—compare the profit-making features offered by* **UNIVERSAL.**

ROCK AND GRAVEL
THE 293-Q PORTABLE STONE PLANT



Featuring three stages of reduction with jaw crusher for primary crushing and Universal's exclusive TwinDual rolls for two stages of secondary crushing. Produces money-making volume of finished aggregate for road surfacing, concrete work, etc. Also used with great success in gravel pits containing material which requires a large opening primary. The 293-Q has proved its performance over the years. Capacity—125 t.p.h. 1".

UNIVERSAL ENGINEERING CORPORATION
A Division of Pettibone Mulliken Corporation—Chicago
617 C AVENUE N. W. CEDAR RAPIDS, IOWA
ENGINEERS AND BUILDERS OF "STREAM-FLO" ROCK, GRAVEL AND LIME PLANTS, SCREENING AND WASHING PLANTS, CONVEYORS, APRON FEEDERS

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PETTIBONE MULLIKEN CORP. CHICAGO, ILLINOIS
GEORGE HAISS MFG. CO., INC. BRONX, NEW YORK, N. Y.

Specify KVS Unit Responsibility

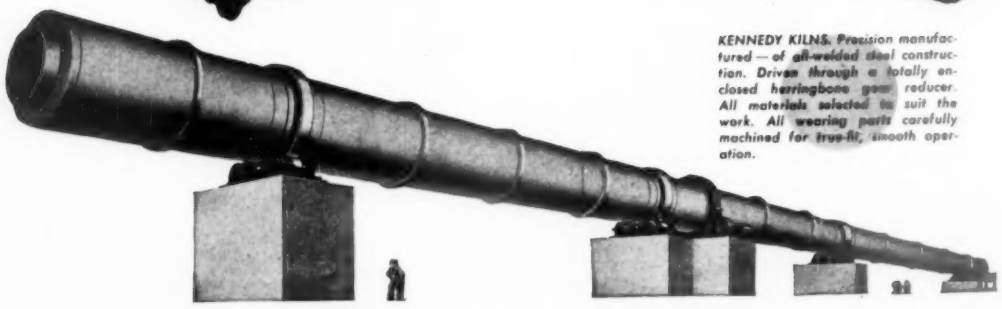
In modern cement plants, it's KVS for steady flow — in volume — at fractional cost

From one end to the other, the modern cement plant — KVS-Engineered — is geared for peak efficiency. Every step of the way — from primary reduction through conveying for shipment — there's Kennedy equipment on the job. And KVS Unit Responsibility — design, manufacture, installation — is assurance it is dependable equipment . . . fit for the job . . . set right for the job.

Specify KVS Unit Responsibility . . . for the complete modern cement plant . . . for special and the standard equipment listed below.

KILNS • COOLERS • DRYERS • CRUSHERS • HAMMERMILLS • SCREENS • FEEDERS • CONVEYORS • ELEVATORS • GRINDING MILLS • CLASSIFIERS • WASHERS • COAL PULVERIZERS • BOILERS PNEUMATIC TRANSPORT SYSTEMS.

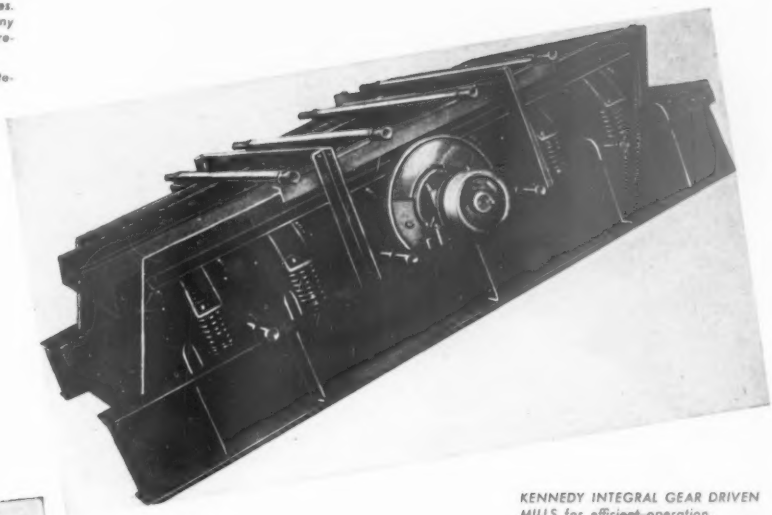
WRITE TODAY for our descriptive catalog on these and other Kennedy equipment for the modern cement plant.



KENNEDY KILNS. Precision manufactured — of all-welded steel construction. Driven through a totally enclosed herringbone gear reducer. All materials selected to suit the work. All wearing parts carefully machined for true-fit, smooth operation.

KENNEDY VIBRATING SCREENS — for 95% sizing efficiency. No jogging of the frame . . . vibration is in the screen. Type of vibration permits lower speeds for large pieces . . . higher speeds for small pieces. Available in three types — and many sizes — for any screening requirement.

Low installation cost . . . low maintenance cost.



KENNEDY INTEGRAL GEAR DRIVEN MILLS for efficient operation. The most advanced and versatile type made today. Applicable as rod mill, ball mill — for wet and dry grinding and for air sweeping. Power needs reduced by patented design enabling motor to be direct-connected to mill through double reduction herringbone gears or noiseless worm gear.

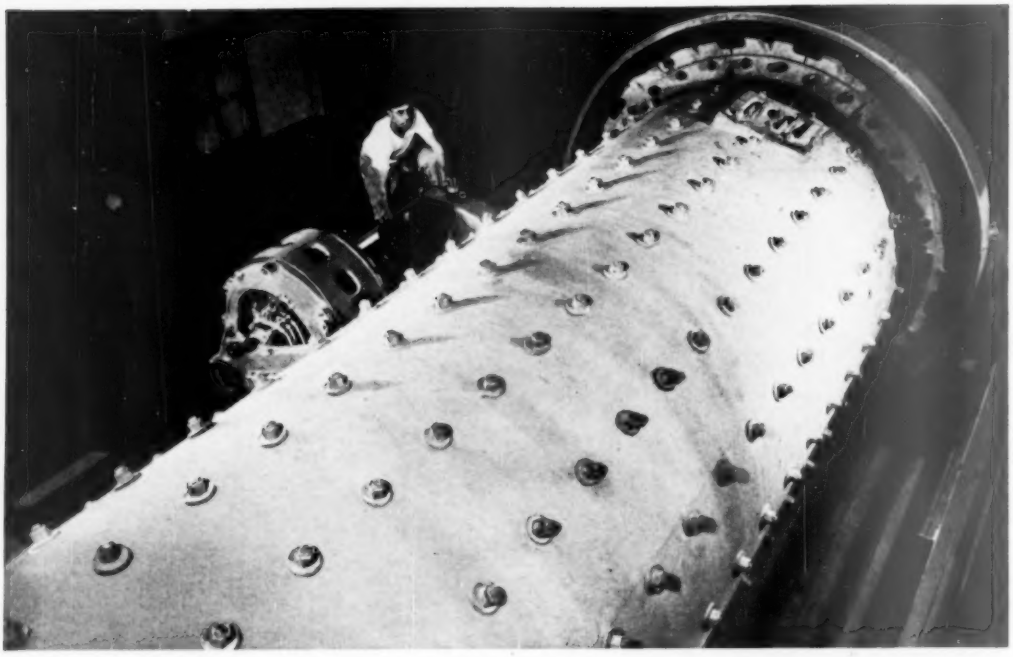
KENNEDY ROLLER BEARING GEARLESS CRUSHERS for 50% power saving . . . exert work on crushing, NOT on operation. No power loss in running belts or gears — synchronous motor is built right in the pulley assembly. Run on self-aligning roller bearings. Forced feed system lubricates continuously.

FOR 80% MAINTENANCE SAVING . . . no frictional losses of gears, belts, countershafts. Distinct hammer and anvil action. No direct crushing against bearings. "Alarm" oil pressure control. Available in a wide variety of capacities as standard type, short shaft, and low head gyratory gearless crushers.

Efficiency is the logical result of design, manufacture, installation. If it's cement machinery, SPECIFY KVS UNIT RESPONSIBILITY.

Kennedy-Van Saun Manufacturing and Engineering Corp.

2 Park Avenue, New York 16, N. Y.



11 Years Trouble-free Washing With Allis-Chalmers Blade Mill

NEITHER LINERS nor blades have had to be replaced on this 7 by 18 ft A-C blade mill in the washing plant of Blair Limestone Co., Martinsburg, W. Va. No shut-downs since mill was put in production in 1938!

Limestone flux for blast furnace feed is produced here. Specifications are exacting; product must be free of contaminants. This blade mill has 112 internal cast steel blades which wash stone and chips thoroughly clean by *combined cutting and washing action.*

CHECK IMPORTANT FEATURES

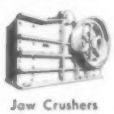
Because Allis-Chalmers blade mills are supported on trunnion bearings instead of rollers, faster speeds and more intensive washing are possible. This mill, for example, revolves more than *twice as fast* as the average roller mounted scrubber. A permanently fixed relationship between gearing and drum is assured.

Shells are heavy, all-welded steel plate. A special seal on feed end bearing prevents backwash of abrasive pulp. Liners and blades are renewable and are available in abrasion-resistant alloy steels.

Allis-Chalmers blade mills handle ores and aggregates up to 10 inches in size. Mill diameters are 6, 7, 8 and 9 ft; lengths 10 to 22 ft. Variable speed, pulp level and blade adjustment make possible a wide range of applications in mining and processing.

A trained A-C processing engineer in your area will gladly look over your production set-up and help you select an economical blade mill or other washing equipment. A-C offices or distributors are in principal cities in the U. S. and throughout the world.

Kilns, Coolers, Dryers



Jaw Crushers

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Vibrating Screens

AND OTHER EQUIPMENT FOR THE CRUSHING, CEMENT AND MINING INDUSTRIES

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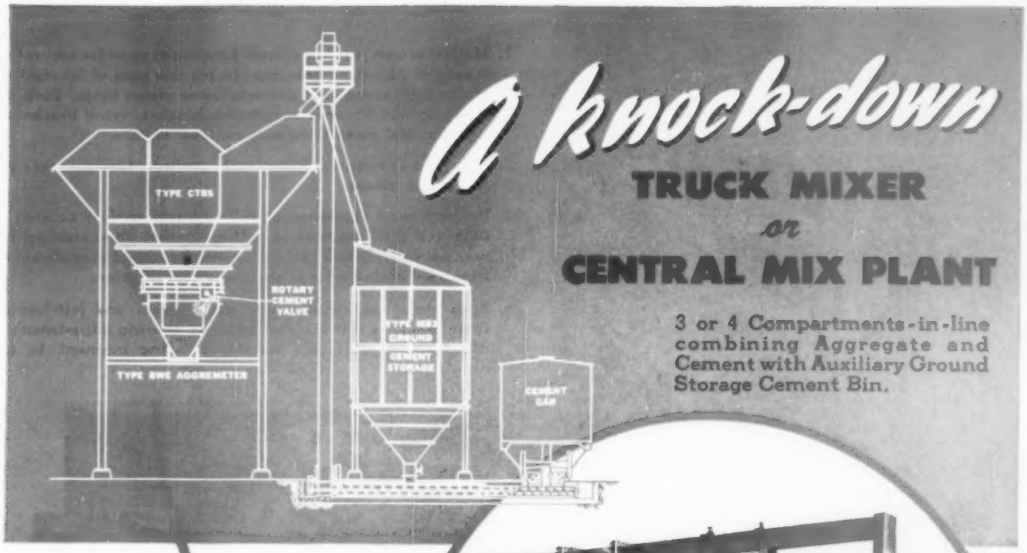
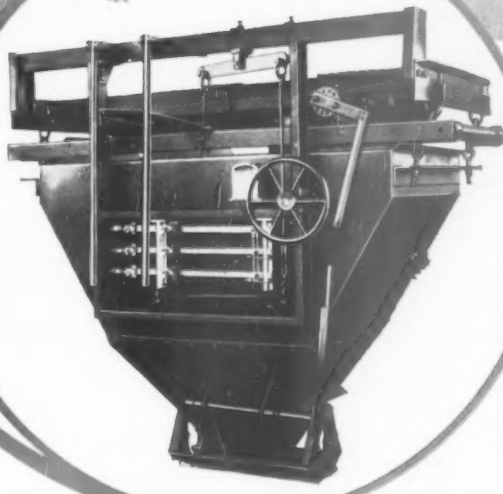


A knock-down TRUCK MIXER or CENTRAL MIX PLANT

3 or 4 Compartments-in-line combining Aggregate and Cement with Auxiliary Ground Storage Cement Bin.

The heart of the above ERIE CTBS Knock-down Truck Mixer plant is the improved Erie BWE AggreMeter at the right. It is arranged with one compartment for aggregate and one for cement—all controls are located for fast and easy operation. An Erie MB-3 Cement Bin alongside, provides up to 492 bbls. auxiliary cement storage, fed by under track screw conveyor to vertical bucket elevator which directs cement to main plant or auxiliary cement storage. (Type LB-3 Cement Bin offers up to 1025 bbls. of cement storage.) This is just one of scores of Erie Bin Combinations so let's have your aggregate and cement storage and batching problem.



ERIE TYPE BWE AGGREMETER

Which 3 compartment-in-line combining aggregate and cement fits your needs?

CEMENT GROUND STORAGE		MAIN PLANT*			AGGREMETER
TYPE	CAPACITIES	TYPE	TOT. CAP.	CAPACITY CEMENT COMPARTMENT	TYPE BWE 3 BEAM SCALE
MB-1	172 to 194 bbls.				1 ½ — Cu. Yd.
MB-2	270 to 304 bbls.	CTBS	98 Cu. Yd.	230 to 260 bbls.	2 — Cu. Yd.
MB-3	437 to 492 bbls.	CTBS	118 Cu. Yd.	275 to 308 bbls.	3 — Cu. Yd.
		CTBS	160 Cu. Yd.	330 to 375 bbls.	4 — Cu. Yd.
		CTBS	202 Cu. Yd.	380 to 430 bbls.	5 — Cu. Yd.
					6 — Cu. Yd.

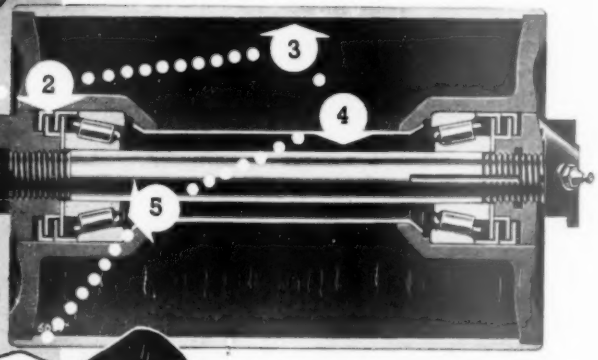
*For 4 Compartments-in-line combining aggregate and cement ask about Erie Type CTES plants and EWE AggreMeters.

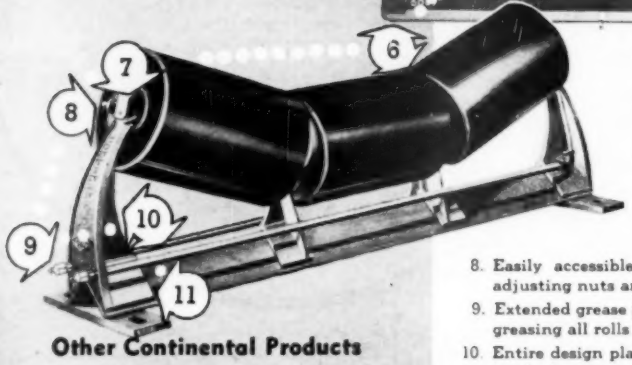
ERIE STEEL CONSTRUCTION COMPANY

798 GEIST ROAD • ERIE, PENNSYLVANIA

These outstanding features make Continental IDLERS your logical choice

1. Malleable iron nut has several functions; provides accurate means of adjusting bearings; forms one pass of labyrinth grease seal; spaces and protects inner grease seals. Socket recess in nut fits over supporting bracket, tying brackets together and permitting easy removal of rolls.
2. Five-pass labyrinth grease seals exclude foreign matter and retain grease.
3. Uniform wall thickness of rolls assures perfect balance. Cast iron rolls made of centrifugally cast pipe; steel rolls made of welded steel tubing. Continuous weld of malleable iron head makes rolls of one-piece construction.
4. Accurately machined shaft with right- and left-hand threads allows minute and accurate bearing adjustment. Short shaft projection reduces bending moment to a minimum.





5. Timken Tapered Roller Bearings provide for radial and thrust loads.
6. All Standard Idler rolls same length and interchangeable. Rounded edges and close spacing prevent belt cutting.
7. To prevent rolls from coming out of place during shipment or operation, all rolls are secured to brackets. Steel clips used on end brackets and retaining screws on inside brackets.
8. Easily accessible Alemite hydraulic fittings in side of adjusting nuts are standard equipment.
9. Extended grease pipe from center roll is standard; permits greasing all rolls from outside for safety.
10. Entire design planned to shed dirt; dished malleable iron head, sloping surface of nuts, inverted V shape of brackets and angle base all tend to prevent dirt or other matter from accumulating and stopping rolls.
11. Certified malleable iron brackets, heavily ribbed, welded to angle base, making one-piece, rigid unit.

Other Continental Products

- SCREW CONVEYORS
- BUCKET ELEVATORS
- SCREW ELEVATORS
- FLIGHT CONVEYORS
- APRON FEEDERS
- RECIPROCATING FEEDERS
- BELT FEEDERS
- GEARS AND REDUCERS

CG-4904

ORDER NOW! Standard Idlers shipped from stock. Complete specifications and prices on request.

INDUSTRIAL DIVISION
CONTINENTAL GIN COMPANY
BIRMINGHAM, ALABAMA
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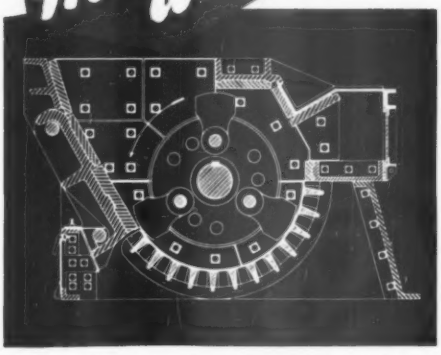
25% to 75% SMALLER INVESTMENT

with a Williams "Super-Slugger" Crusher

Here's why



Feed opening 41″x 30″ to 51″x 81″. Hammer blows 10,800 blows per minute in the smallest size, each blow 1,285,200 foot pounds to 17,280 blows per minute in the largest size, each blow 2,893,760 foot pounds. Size of product quickly changed by using grates with smaller openings.

because it reduces power shovel loaded rock to 1½ inch or ¾ inch in one operation

In one operation! That means not only a saving in machinery, less depreciation by wear and tear, but the additional savings of foundations, conveyors, drives and buildings. Because the Super-Slugger is a heavy duty hammermill that can crush power shovel loaded rock down to feed size for fine grinding or to commercial crushed stone. Built to do a giant sized job because it's heavily reinforced at all parts subject to shock and wear . . . with extra heavy manganese steel liners. Shafts of unusually large diameter. The Super-Slugger is a real payload and profit builder! For detailed information write for bulletin 634.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
800 ST. LOUIS AVENUE — ST. LOUIS 6, MISSOURI

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WILLIAMS ALSO MAKES—

Heavy-duty hammermills in smaller sizes for all quarry operations; impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "package" crushing and grinding plants.

WILLIAMS

CRUSHERS • GRI[illegible]RS • SHREDDERS

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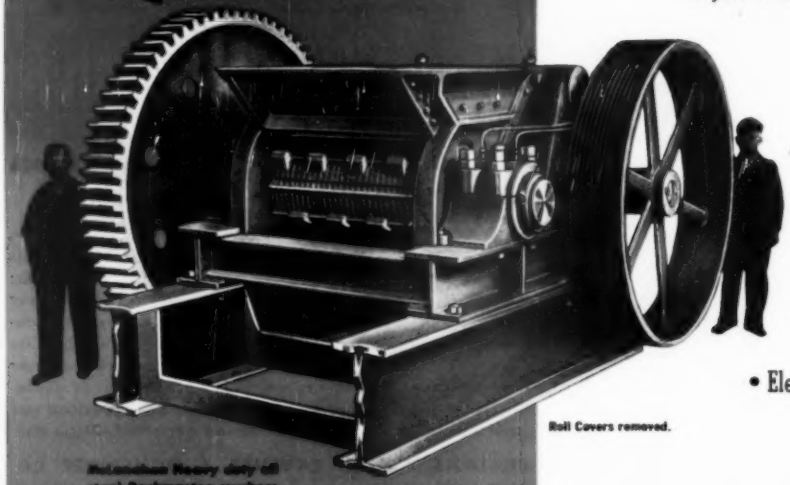
First! SINCE 1835

DESIGNERS AND BUILDERS OF ECONOMICAL

CRUSHING

and other Pit, Mine and Quarry

EQUIPMENT



Roll Covers removed.

McLanahan Heavy duty all steel Rockmaster crushers for primary and secondary work have proven outstanding in many installations for use on limestone, gypsum, shale, gravel, iron ore, open hearth slag and many other difficult crushing problems and operations.

THE THINGS WE BUILD . . .

Primary and Secondary Single and Double Roll Crushers for Every Capacity

- Jaw Crushers
- Portable and Semi-Portable Crushing Plants
- Dry Pans Super Heavy Duty
- Conveyors
- Dryers of Revolving Type
- Elevators
- Feeders
- Hoists
- Jigs
- Screens
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- Bearings
- Bin Gates
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- Elevator Buckets
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- Pulleys
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- Sheaves
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McLANAHAN AND STONE CORPORATION

Pit, Mine and Quarry Equipment Headquarters
Since 1835
HOLLIDAYSBURG, PENNSYLVANIA

★★★★ **Barber-Greene** ★★★★

PRTD. IN U. S. A.

B-G COST-SAVING BULLETIN No. 4905

"MILLION DOLLAR PLANT" FEATURES OUTSTANDING BELT CONVEYOR SYSTEM

Simple Conveyor Proves Ideal "Second-story Man"

B-G Reversible Flat Belt Conveyor solves awkward package handling problem.

Moline, Ill.: — Getting a variety of packaged goods — sacked cement and lime, kegs of nails, bagged insulation, furniture and hardware—into and out of the second story of their warehouse was a problem that caused Moline Consumers Company to call in its local B-G distributor. The simple, low-cost solution is shown above — a B-G Flat Roll Belt Conveyor, adaptable to both inclined and horizontal use, and equipped with a serrated belt to grip smooth packages and prevent slipping.

Important to the success of this conveyor is the fact that it is powered by a reversible 5 h.p. motor. Thus, it acts both as an unloading and loading unit — from dock to warehouse, from warehouse to dock.

Uses 15 B-G Conveyors to Move Sand and Gravel from Pit to Dock

Port Washington, N. Y.:—The aggregate industry, widely noted for its large scale and efficient use of belt conveyors, offers few examples more outstanding than the Port Washington plant recently purchased by Colonial Sand Company. Designed by Merritt, Chapman and Scott Company, this million-dollar, all steel and concrete plant has had notable success in cutting the cost of moving material from pit to plant to loading dock.

High Capacity Conveyor Setup Is Flexible, Semi-Portable

Three thousand feet of B-G Conveyors—fifteen units in all—underlie the high capacity of this plant and provide the flexibility required for changing setups and relocating conveyors as the need occurs.

In contrast to rigidly permanent conveying setups, the B-G Conveyors are made up of standard "packaged" units with a high degree of interchangeability that simplifies assembly and disassembly for lengthening, shortening or relocating on the job.

Three field conveyors, fed by electric shovels, feed the field hopper, and another conveyor carries material to a crusher-scalper unit. From here, via six other separate conveyors, material is scrubbed, screened, separated and stockpiled. A B-G Radial Stacker is used to stockpile sand only. From storage, a 682-foot conveyor carries materials under a roadway to a nearby dock where they are loaded onto barges by a B-G Dock Conveyor, and shuttle-type barge loading conveyor.

Loading barge at Port Washington plant. Shuttle conveyor permits loading barges on either or both sides of the dock.

Foundry Eliminates Costly Hand-Loading of Heavy Material

Chicago, Ill.:—There's a fine example here in the Pyott Foundry of how easily and simply a single short B-G Belt Conveyor can replace hand methods and cut costs to rock bottom. This company had installed a briquet-making machine to reclaim cast iron borings and turnings, for final re-use in its own furnaces. Loading this heavy material into the 12-ft. high hopper was far too costly and inefficient when done by hand—a back-breaker, at best.

So, a lightweight, low-cost 36-ft. B-G Permanent Conveyor was installed to do the job. Equipped with a small three-sided loading hopper at the foot end, it takes scrap brought from the foundry in hand wheelbarrows, and elevates it to the briquet machine hopper at the touch of a button.

Effective use of simple B-G Conveyors is one way in which plants of all types are minimizing the expense of moving all sorts of bulk and packaged materials. Volumes do not have to be large to justify their low cost. This job involves only four or five tons per day, which could not be handled so efficiently with any other method.

(See photo below)

B-G Belt Conveyor economically elevates heavy scrap material.

Doubles Capacity, Lowers Cost with B-G Conveyor

Punxsutawney, Pa.:—Increased unloading capacity and lower maintenance cost were the objectives when the Kurtz Coal, Lumber and Building Supply Co. here decided to replace a vertical bucket elevator with a single 175-ft. B-G Permanent Belt Conveyor.

To date, over 250 cars of 1-inch and 2-inch stone have been unloaded and over 12,000 tons of stone unloaded and stacked. The final result: Plant capacity doubled, and not a cent for repairs.

Order and efficiency are reflected in the clean lines of this compact yard.

Ready-Mix Plant Simplifies Unloading and Storing Operations

Costly, Complicated Equipment Eliminated by Radial Stacker and Conveyors

St. Petersburg, Fla.: — Operators of the Pinellas Lumber Company, progressive local cement block and ready-mix plant, look with satisfaction on their profit-making aggregate-handling belt conveyors. Where before there was a complicated system of shuttle and tripper assemblies — costly to operate and maintain — now a simple B-G Radial Stacker and four economical B-G Permanent Conveyors have taken over.

For surge capacity, about 2500 tons of aggregate are kept available. This is received in hopper bottom cars and discharged onto a 12-ft. feeder conveyor which in turn discharges into a 48-ft. permanent conveyor at right angles to the feeder. This conveyor supplies the 78-ft. radial stacker which is mounted on railway wheels running on a rail on a low concrete structure.

Thus a kidney-shaped pile of aggregate separated into four compartments is always maintained. This pile covers an 80-ft. tunnel conveyor, fed by eight gates, which supplies the 201-ft. mixing and batching conveyor.

Radial stockpiling of bulk material, a B-G development, has many advantages: It minimizes space required for storing several classes of material, it facilitates quick and easy reclaiming and requires a bare minimum of manpower.

Four-Flight Conveyor Replaces 6½ Miles of 6% Grade Track

Roanoke, Va.: — For years, the Blue Ridge Stone Corp. has used six railroad locomotives to haul limestone from the quarry three-quarters of a mile to the processing plant. This required 6½ miles of track and negotiating a 6% grade. Now a four-flight B-G Belt Conveyor is doing the job at a 350 tons per hour clip, and further improving operations by maintaining a 24-hr. stock pile at the plant. The first three flights of the system haul stone from quarry to stock pile. The fourth delivers from stock pile to plant. Here 3,798 ft. of B-G Conveyors replaced far more costly and far less efficient equipment.

B-G Radial Stacker Solves Asphalt Problem

Thornton, Ill.: — Highly portable B-G equipment accomplished results normally achieved only by costly permanent units for the Gallagher Asphalt Company. For a bituminous resurfacing contract, the company had to unload the stock pile well ahead—over 53,000 tons of aggregate. A B-G Radial Stacker, fed from a B-G Belt Feeder, unloaded and stored up to 24 cars per day. Storage was over two steel tunnels each equipped with a B-G Belt Conveyor, one for sand and one for stone. Reclaiming the proper combination via these conveyors was simple and inexpensive. Typical of B-G standardized design, these conveyors are easily dismantled and reassembled for relocation and re-use on other jobs.

ECONOMICAL TWO-MAN OPERATION IN THIS 150 FINISHED TONS PER HOUR OHIO PLANT

B-G Conveyors, Crusher and Bucket Loaders Provide Required Flexibility for Job

Wapakoneta, Ohio:—Two men are all that are required to handle the extensive operations of the Wapak Sand and Gravel Company near here. This plant covers 80 acres, yet the one dragline operator and the one supervisor at a central control panel which operates the five B-G Conveyors, Feeders and Crushers, keep the entire operation going.

A fine example of efficient layout, the plant is set up ideally to minimize machine and man-hour requirements. The $1\frac{3}{4}$-yard dragline at the pit loads a surge hopper over the first B-G Conveyor which feeds the B-G Ebersol Crusher. Another B-G Conveyor carries the aggregate from there to the main plant. After processing, the material is delivered to one of three 78-ft. B-G Radial Stackers which stockpile sand and gravel separately.

All material is loaded from the stock piles by two B-G Loaders — one pneumatic-tired and the other crawler-mounted.

Operating at a capacity equal to many plants equipped with extensive and permanent installations, this plant has actually no permanent construction other than the small footings under the radial stackers and the screening machinery. The B-G Conveyors are easily moved, relocated, lengthened or shortened. A spare swing conveyor is kept on hand against the time when the excavating must be further away from the plant. Thus the whole operation is on a flexible and highly efficient basis.

General view of Wapak Sand and Gravel Co. setup illustrates modern aggregate production at its best; continuous flow of material is maintained at low cost through use of B-G Belt Conveyors and Barber-Greene Ebersol Crusher.

Barber-Greenes at Azuza Make Show Place for Industry

Considered to be one of the showplaces in the industry, the Azuza Rock and Sand Company's plant represents an ideal use for belt conveyors, as built by Barber-Greene to the exacting specifications of the company's management. For more than a thousand feet the pit-run aggregates are brought by belt conveyor from deposit and lifted 175 ft. to plant. Push-buttons start and stop equipment in proper sequence.

Three B-G Standardized Truss Conveyors supply the operation. In unit one of the plant a 36-in. Conveyor, 300 ft. long, carries material from the primary crusher to a 36 in. x 200 ft. B-G Stacker Conveyor, which builds the 7,000-ton live surge pile. Running from a 120-ft. concrete tunnel beneath the surge pile, a 36 in. x 518 ft. B-G Conveyor is synchronized to feed the washing and processing tower, which operates independent of unit one.

The 450 tons per hour capacity of this B-G equipped plant is great by any standard. Fifty dump trucks and 17 ready-mix trucks are kept busy distributing this plant's products in addition to the bulk of the production, which goes out by rail.

stock pile for the Wapak Sand and Gravel Co. Photo shows the Loaders and the three B-G Radial Stackers which make possible large co[illegible]

General view of Azuza Sand and Gravel Plant, showing two of the three B-G Conveyors, which maintain the raw material supply for the 450 tons per hour finished production.

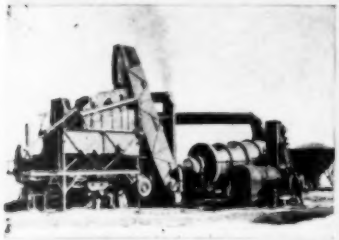
THE B-G LINE CUTS COSTS ALL ALONG THE LINE...

See Barber-Greene for:

B-G BUCKET LOADERS: Crawler or pneumatic tire mounted. For low cost truck loading of bulk materials.

B-G DITCHERS: Crawler and pneumatic tire mounted, for digging trenches from 5½" to 24" wide and to 8' 3" deep.

B-G PORTABLE CONVEYORS: For moving all bulk materials and packaged goods. Variety of lengths, belt widths and capacities. Electric or gasoline power.



B-G BITUMINOUS PLANTS: Highly portable plants for producing all types of mixes—up to 120 t.p.h.

B-G FINISHERS: Automatically place smooth, compacted surface regardless of variations in subgrade.

B-G COAL YARD EQUIPMENT: Belt and chain-and-flight Portable Conveyors; self-propelled, pneumatic-tired. Also, hopper-car Unloaders.

Use Barber-Greene's 30 Years of Experience to Help You Plan Your Job. It can be Valuable and is at Your Service

It always pays to eliminate guesswork. Barber-Greene offers you the benefit of over thirty years' experience in designing and building equipment proved year after year on jobs—and in industries—like yours. Barber-Greene's Representatives are material handling specialists with practical experience in successfully applying the right machine to jobs like yours. Consult your Barber-Greene Distributors, or write directly to Aurora, Illinois, for information you need to do your job most profitably.

Barber-Greene Company
Aurora, Illinois, U.S.A.
Cable address "Bargreene"

Send information as indicated:

( ) B-G Permanent Conveyor of _____ t.p.h. capacity for moving _____ a distance of _____ ft.
material

_____

_____
other specifications

( ) Information on _____
other B-G equipment

( ) Have a Representative Call

Name _____

Company _____

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City_____ Zone_____ State_____

RP—17,500

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Send This Coupon!

The coupon will bring you complete information on any Barber-Greene machine without cost or obligation.

We will be glad to have our representative call to discuss your material handling problems with you.

We maintain a Department for the sole purpose of solving your material handling problems.

BARBER-GREENE COMPANY
Aurora, Illinois, U.S.A.

TRUCKS and SHOVELS keep on the *move*

when you detonate with PRIMACORD

You can figure on better digging when you shoot with Primacord. *Operations speed up all along the line.*

Primacord does this with a combination of forces that team up to give you more complete fragmentation. Down-hole lines initiate the whole charge instantly, from top to bottom, with all the power of primer cartridges. Main lines can be laid out so that front holes go a split second before succeeding ones, allowing for planned relief of burden.

You can get Primacord, wound on easy-to-handle spools, in a grade to meet every blasting condition. It's insensitive to stray currents, and hooks up as fast as you can tie square knots or half hitches. Ask your supplier about Primacord, or write direct to The Ensign-Bickford Company, Simsbury, Connecticut. P-23

PRIMACORD-BICKFORD Detonating • Fuse •

***Also* Ensign-Bickford Safety Fuse Since 1836**

CHASE BAGS

THE PREMIUM PACKAGE

pre′mi·um—(prē′mi·um; 159), *n.*; *pl.* PREMIUMS (-umz). [L. *praemium*, orig., what one has got before or better than others.

FOR YOUR PREMIUM PRODUCT

Your product is *important* to you and to your customer. So . . . don't just put it in a bag . . . put it in a Chase Bag—the premium container for your premium product—the container that gives you all 6 of these important advantages:

1. Better Appearance
2. Clean, Colorful Printing
3. More Sales Appeal
4. Better Materials Protect Your Product
5. Better Acceptance of Your Product
6. Especially Designed for Your Product

MULTIWALL PAPER BAGS

Your Chase Salesman is a Packaging Expert who will be glad to help provide a more economical and more efficient container for your product. Don't delay—write us today on this important subject.

CHASE 1847 BAGS

CHASE BAG CO. GENERAL SALES OFFICES, 309 WEST JACKSON BLVD., CHICAGO 6, ILL.

BOISE • DALLAS • TOLEDO • DENVER • DETROIT • MEMPHIS • BUFFALO • ST. LOUIS • NEW YORK • CLEVELAND • MILWAUKEE
PITTSBURGH • KANSAS CITY • LOS ANGELES • MINNEAPOLIS • GOSHEN, IND. • PHILADELPHIA • NEW ORLEANS • ORLANDO, FLA. • SALT LAKE CITY
OKLAHOMA CITY • PORTLAND, ORE. • REIDSVILLE, N. C. • HARLINGEN, TEXAS • CHAGRIN FALLS, O. • HUTCHINSON, KAN. • CROSSETT, ARK.

DIESEL MAINTENANCE CUT 50%

Sun Diesel Lubricant Eliminates Hard Carbon, Stops Sludging, Ends Costly Bearing Failures

A company using many diesels to power cranes, air compressors, and heavy-duty earth-moving equipment found itself in trouble. Piston rings were sticking with hard carbon; sludging was causing clogged oil-pump screens, bearing failures, and abnormal cylinder wear. As a result, there was frequent necessity for complete engine overhauls. Downtime was excessive.

On the recommendation of a Sun Engineer, the company changed to a Sun "Job Proved" diesel lubricant. Since then, two years have passed—two years of trouble-free operation. There have been no stuck rings, no bearing failures, no clogged oil-pump screens. Cylinder wear is at a minimum. General maintenance costs have been reduced 50 percent. Efficiency is way up.

Whatever your lubrication needs, Sun "Job Proved" Products can help reduce operating and maintenance costs, and increase your output. The services of a Sun Engineer are available without obligation to make a lubrication survey of all your mechanical equipment for quarrying, preparing and transporting rock products. He will be glad to recommend the Sun lubricants precisely suited to your requirements. Call the nearest Sun Office for further information.

SUN OIL COMPANY • *Philadelphia 3, Pa.*

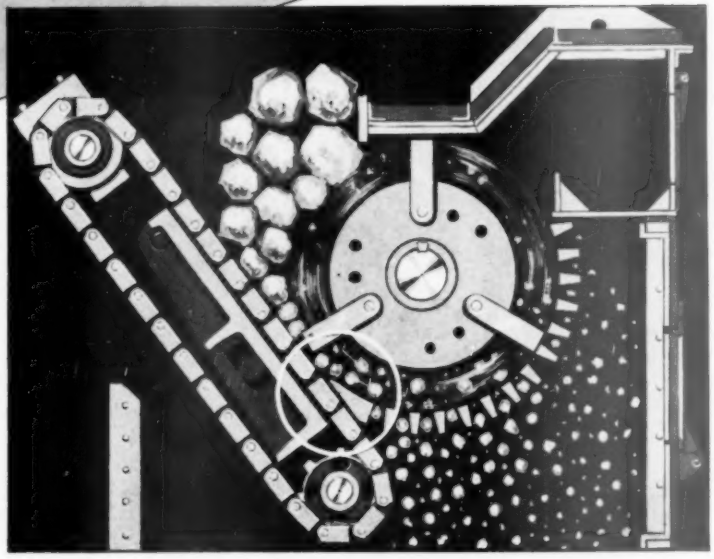
In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

THE ONE and ONLY NON-CLOG

The Tried and Proven DIXIE Hammermill



Better crushing begins here! Cross section drawing illustrates "heart" of Dixie Non-Clog Hammermill where Extended Moving Breaker Plate construction guards against passage of oversize material . . . results in improved grinding control for unvarying uniformity of product.

Your ASSURANCE of GREATER PRODUCTION at LESS COST

The one and only Dixie NON-CLOG Moving Breaker Plate Hammermill* sets a new standard of crushing efficiency in the reduction of wet, sticky materials.

If you have wet, sticky material to crush, if you have difficulty in reaching and maintaining desired production, *if you have any crushing problem at all,* it will pay you to take advantage of this vastly improved crushing principle.

* U. S. Patents Granted & Pending

Dixie Non-Clog Hammermills are made in sizes ranging from 24" up to 72" diam.

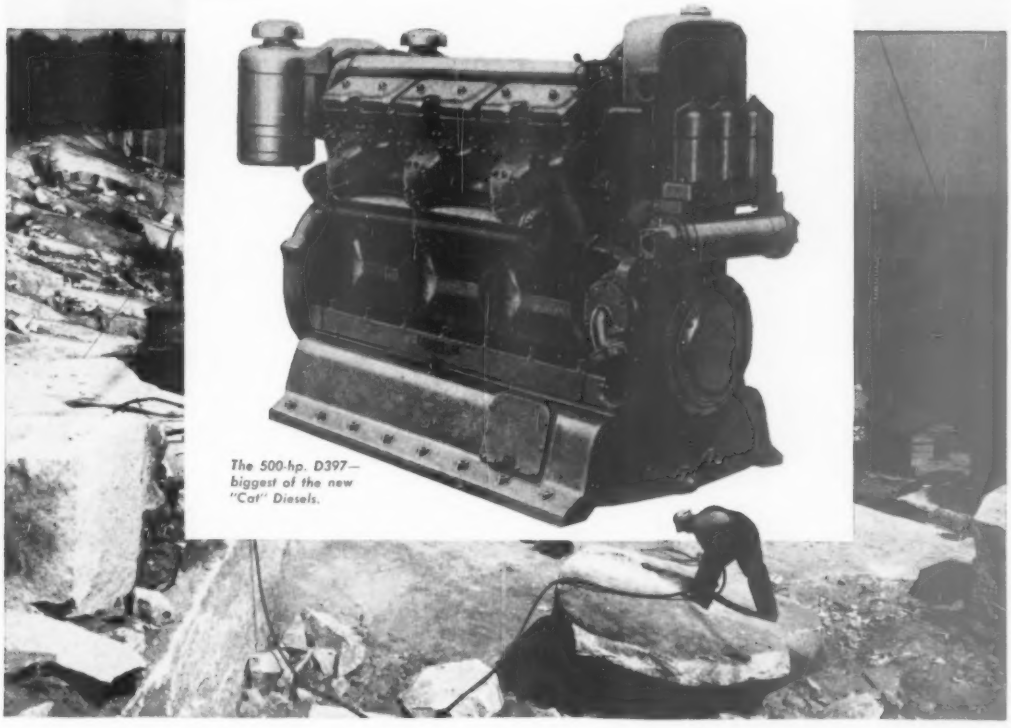
WRITE TODAY FOR COMPLETE DETAILS

DIXIE MACHINERY MFG. CO.

MAIN OFFICE AND PLANT

4202 Goodfellow Ave., St. Louis 20, Mo.

New BIG YELLOW ENGINES BUILT TO HANDLE BIG JOBS



The 500-hp. D397—biggest of the new "Cat" Diesels.

PIT and quarry men have learned from long experience that they can always depend on "those big yellow 'Caterpillar' Diesels." They've proved themselves in shovels, draglines, dredges, crushers, gravel plants, air compressors, and electric power systems.

Now you can power even bigger machines—with new, bigger "Cat" Diesels. In addition to present models, four great new Engines, ranging up to 500 hp., and four new Electric Sets, generating up to 314 kw., are now coming out of the world's finest, most modern engine factory. Every one is designed to burn low-cost, non-premium fuels—assuring substantial savings. Every one is given a closely supervised dynamometer run to assure proper break-in and full horsepower output.

When you buy new rock, gravel or brick machinery, specify "Caterpillar" Diesels for power. When you consider replacing the power in your present equipment, call on your reliable "Caterpillar" dealer. For immediate information, SEND IN THE COUPON.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR
REG. U. S. PAT. OFF.
DIESEL

ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

CATERPILLAR TRACTOR CO.
Box RP-48, Peoria, Illinois

Send me specifications on the new "Cat" Diesel Engines and Electric Sets.

Name_____

Address_____

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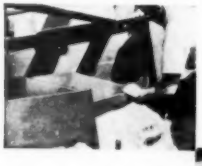
NEW

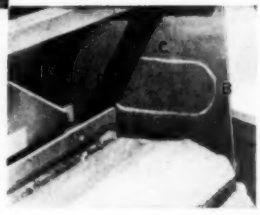
a major advance in the mechanical refinement of classification units

THE DORR HX CLASSIFIER—DUPLEX MODEL

...the Dorr TYPE H Classifier



◀ Chalk marking the rake path of a duplex Dorr HX Classifier in shop demonstration.



Type H Classifier rake path ▶ chalked on side of tank. Note flat raking and return strokes (A and C) and eliptical raising and lowering strokes (B and D). Regular pattern of rake path shows how rakes are synchronized both horizontally and vertically and balanced at all times.

Incorporating an entirely new and radically different headmotion design and rake path, the new Dorr Type H Classifier line represents a major step forward in the mechanical refinement of classification units. It offers many definite advantages over its predecessor, the Type F . . . yet retains all the features which have made the Dorr Classifier an accepted standard throughout the world.

Simplicity is the keynote of Type H design. It has few moving parts and the simplest Classifier lubrication system yet devised. It employs a fully harmonic raking motion and a long, full-load raking stroke. It is equipped with a hydraulic lift mechanism that provides more than 12 inches of rake lift in the pool. It is designed for *work* . . . for high efficiencies and low operating cost.

Bulletin #2281 gives complete information on this radically different unit. Write for your copy now . . . or better still, have a Dorr engineer show you what the superiority of Type H design means in terms of your own operation. No obligation, of course.

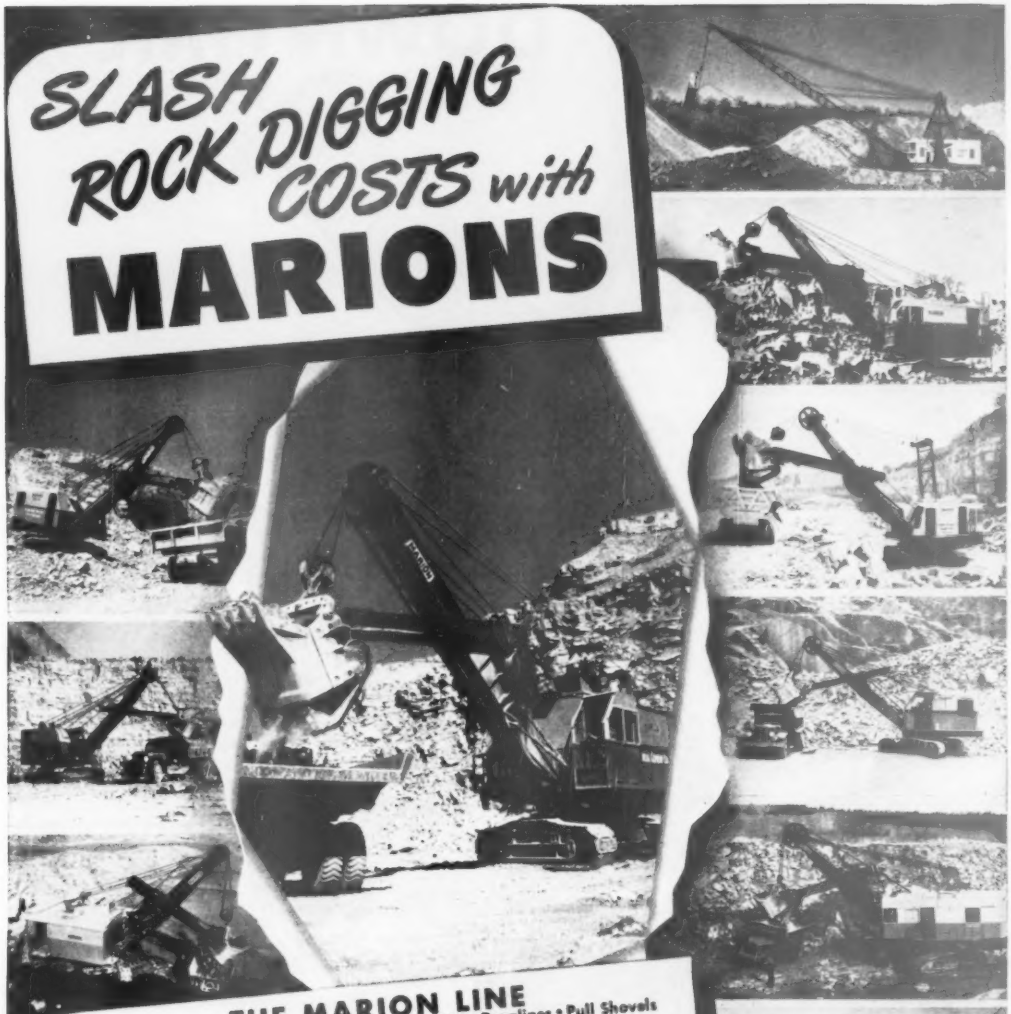
DORRCO

THE DORR COMPANY, ENGINEERS
570 LEXINGTON AVE., NEW YORK 22, N. Y.
ATLANTA • TORONTO • CHICAGO
DENVER • LOS ANGELES
RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.
SUGAR PROCESSING
PETREE & DORR DIVISION, NEW YORK 22, N. Y.
ASSOCIATES AND REPRESENTATIVES
Dorr Technical Services and Equipment Are Also Available Through Associated Companies and Representatives in the Principal Cities of the World. Names and Addresses on Request.

DORR

RESEARCH ENGINEERING EQUIPMENT

SLASH ROCK DIGGING COSTS with MARIONS



THE MARION LINE

Shovels • Draglines • Clamshells • Cranes • Walking Draglines • Pull Shovels

TYPE	CAPACITY
33-M	¾ cu. yd.
362	1½ cu. yds.
372	1¾ cu. yds.
*93-M	2½-3 cu yds.
492	3 cu. yds.
*111-M	3½-4 cu. yds.
4161	5 cu. yds.
151-M	6½ cu. yds.
5323	18 cu. yds.
5561	45 cu. yds.
**7200 Walker	5-7 cu. yds.
**7400 Walker	8-12 cu. yds.
**7800 Walker	15-30 cu. yds.

*Diesel Clutch type and Ward-Leonard electric. **Size of bucket depends on length of boom.

From 3/4 Cu. Yd. MARION Times 1884 To 45 Cu. Yds.

MARION

POWER SHOVEL COMPANY

MARION, OHIO, U. S. A.

Offices and Warehouses in all Principal Cities

REDUCE DOWNTIME

... with THERMALLOY

Feed Ends and Feed Pipes

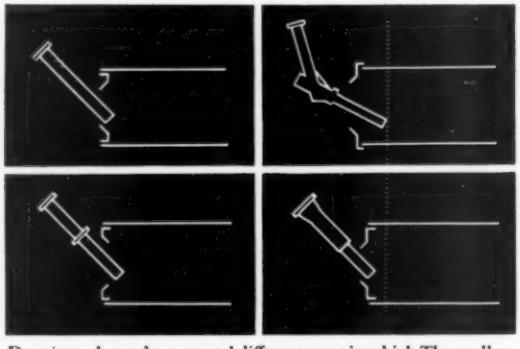
THERMALLOY is tough! It stands up under rough treatment . . . resists high temperatures, corrosive gases and abrasives. Thermalloy Feed Ends have lasted up to *10 times as long* as "bricked-up" ends . . . thereby materially reducing down-time and replacement costs. That's why many kiln operators are switching to THERMALLOY feed ends and feed pipes.

No special "built-up" brick feed end is necessary on your kiln with THERMALLOY end rings. The segmental design is adaptable to a variety of different kiln sizes and prevents cracking due to expansion and contraction. Shell distortion is eliminated, without shortening the effective working length of your kiln.

THERMALLOY feed pipes also play an important part in economical kiln operation. Their ability to resist abrasive wear and withstand elevated temperatures without scaling or cracking has been proved in hundreds of calcining installations.

Other THERMALLOY kiln parts include burner nozzles, cooler parts, drag chain, outlet grates, discharge ends, clinker chutes. For full information, call your nearest Electro-Alloys engineer or write Electro-Alloys Division, 2012 Taylor Street, Elyria, Ohio.

Easy to install



Drawings above show several different ways in which Thermalloy feed ends and feed pipes can be adapted to your kiln.

AMERICAN Brake Shoe COMPANY

ELECTRO-ALLOYS DIVISION
ELYRIA, OHIO

WICKWIRE ROPE

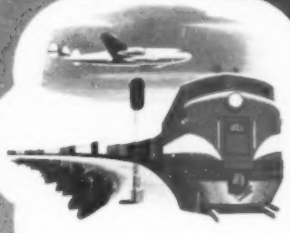
A PRODUCT OF CF&I

Ask any user . . . you'll find them everywhere

In scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® *Preformed*. It lasts longer — is easier to cut, splice and install. It's kink-resistant and safer to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant — Palmer, Mass.

IN THE EAST—Wickwire Spencer Steel Div. of C. F. &I.
500 Fifth Ave., New York 18, N. Y.
IN THE ROCKIES—The Colorado Fuel and Iron Corp.
Continental Oil Bldg., Denver, Colo.
ON THE WEST COAST—The California Wire Cloth Corp.
1080—19th Ave., Oakland 6, Cal.

LOGGING



TRANSPORTATION

MINING

PETROLEUM

MANUFACTURING

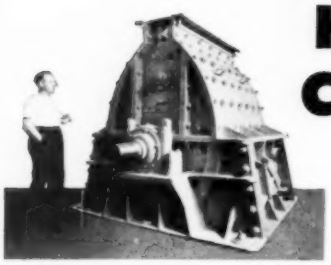
MARINE

CONSTRUCTION

A. E. Brockway

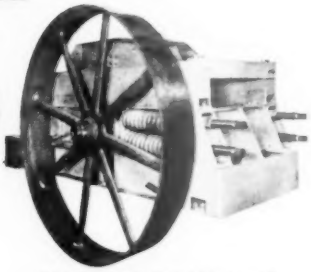
GRUENDLER CRAFTSMANSHIP SERVING INDUSTRY FOR 64 YEARS

GRUENDLER
Heavy Duty CRUSHERS



GRUENDLER 6 X Series Patented CENTER FEED PULVERIZERS

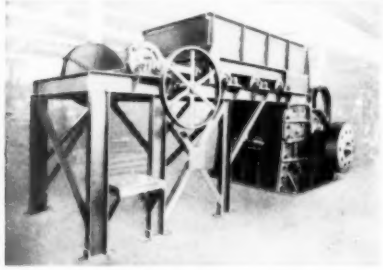
For high capacity secondary reductions up to 300 Tons per hour, — 150 Tons per hour, — 10 mesh and finer.



GRUENDLER PRIMARY and SECONDARY ROLL CRUSHERS

Gear drive or double pulley drive. Roller bearings on main shafts to counter shafts. Water jackets and circulating lubricant systems for handling hot ore or slag. One piece manganese shells also special shells with reversible teeth segments for special work.

TRADE MARK



HEAVY DUTY PRIMARY IMPACT MILL WITH TRAMP IRON CATCHER and FEEDER

Feeds shovel size rock . . . Capacities 50 to 500 Tons per hour. Hopper openings up to 48"x72".

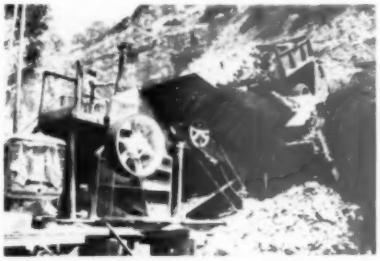
IMPACT HAMMER MILL with RECYCLING BREAKER PLATE

Rugged simple adjustments for low grade Iron, Ores, Bauxite, Phosphate muck and wet, damp, sticky materials.

FOUR GRUENDLER HAMMER MILLS

On the production line in our plant for shipment to one large Company. Here is a combined potential capacity of 500,000 Tons per year, — 10 mesh minus.

ILLUSTRATED BULLETINS, SPECIFICATIONS and OUR PLANT DESIGN RECOMMENDATIONS on written request.



GRUENDLER OVERHEAD ECCENTRIC ROLLER BEARING JAW CRUSHER

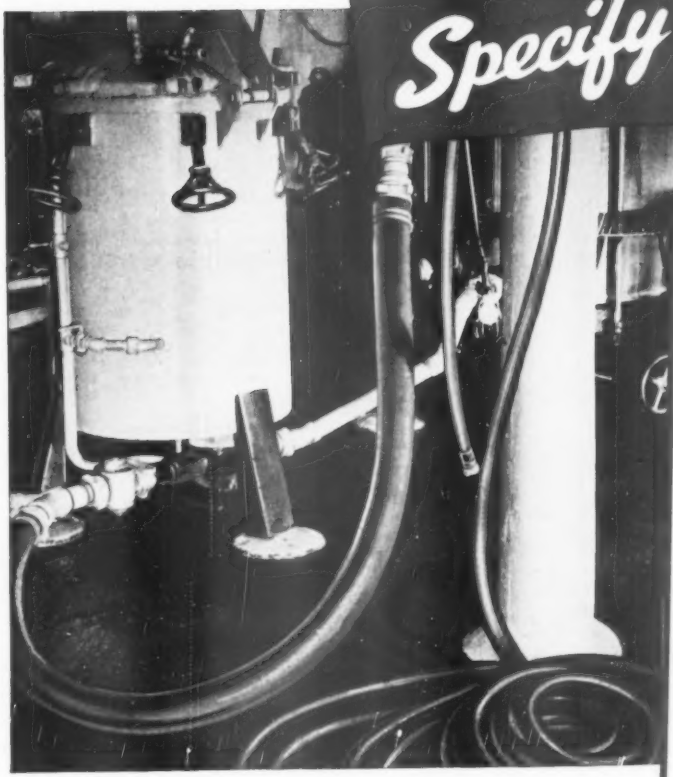
With exclusive Hydraulic Shim Jack. Sizes range from 10x16 to 30x42 Manganese pan type FEEDERS from 24 to 50 inches wide, overlapping trouble free flights. Many Gruendler Feeders have handled over million tons without replacement of pans.

GRUENDLER

CRUSHER & PULVERIZER COMPANY

PLANT AND EXECUTIVE OFFICES: 2915-25 NORTH MARKET, ST. LOUIS 6, MO.

Specify Thermoid



The Thermoid Impregnation Process insures a deeper penetration of rubber between the threads of the yarn, which encases each individual strand with protective rubber. The rubber acts as a sheath between the strands and prevents the destructive abrasive action as the product is flexed in use. To obtain the required rubber penetration, the twist of the yarn must be to exact specifications. With the yarn twisted too tightly, proper penetration of the rubber compound is impossible. This condition produces abrasion, causing premature failure. On the other hand, if the yarn is twisted too loosely, the product lacks tensile strength. Thermoid has discovered the optimum twist of the yarn which assures maximum rubber penetration and greatest strength. The development of Thermoid Impregnation Process is another step forward in Thermoid's planned program of product improvement, assuring maximum service and lower operating costs to industry through the use of Thermoid Industrial Rubber Products.

Versicon Hose Cuts Costs

Now available . . . a multi-purpose hose designed for superior performance with virtually any liquid or gas . . . Thermoid Versicon Hose. It is made with neoprene tube and oil-resistant cover—with high tensile rayon cords to insure maximum strength, light-weight and flexibility.

Versicon, another of the famous quality rubber products made available to industry through Thermoid research, is the answer to a long felt need. Now your nearest Thermoid distributors can supply you with *one hose* for your requirements. Now you can cut your costs and reduce inventory. Versicon eliminates the need for special hose . . . Versicon *is* the special hose. Available from 3/16" to 2½" for use with air, water, oil, gases and virtually all fluids in lengths from 50′ to 500′ depending on size.

It will pay you to ***Specify*** Thermoid!

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

Thermoid Company

Main Offices and Factory • Trenton, N. J., U. S. A.
Western Offices and Factory • Nephi, Utah, U. S. A.
Industrial Rubber Products • Friction Materials • Oil Field Products

You don't lead in sales for 17 years unless you lead in value!

International Trucks have led in heavy-duty truck sales for 17 straight years!

WHAT HEAVY-DUTY TRUCKS offer the biggest value? The most exacting truck buyers in America have answered that one.

You can find their answer by looking at registration figures for new trucks with gross weight ratings of 16,001 pounds or over.

Those figures show that International Trucks have been *America's largest-selling heavy-duty trucks for 17 straight years!*

A heavy-duty truck is a major investment. You can bet your bottom dollar that the men who buy them don't give any line of trucks a vote of confidence like they've given International unless their profit and loss statements show them that it pays.

But don't think that International Trucks offer outstanding value in the heavy-duty field *alone.* There are 22 models of International Trucks plus 1000 different specialized variations to meet individual hauling requirements. Gross vehicle weight ratings range from 4,400 to 90,000 pounds.

Trucks built to meet your specifications—No matter what model International Truck you buy, you get the basic values that have made International Trucks the largest-selling heavy-duty trucks in America for the past 17 years.

You get a rugged truck unweakened by a single compromise with passenger car design.

You get a long-lasting truck. *More than half of all the Internationals built in the last 42 years are still on the job.*

You get a truck specialized to meet your particular specifications; specified by a truck sales engineer who knows your business in terms of the demands it makes on trucks.

See your International Truck dealer or branch.

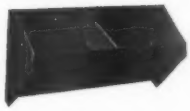
International Harvester Builds
McCormick Farm Equipment and Farmall Tractors
Motor Trucks and Industrial Power
Refrigerators and Freezers

INTERNATIONAL TRUCKS

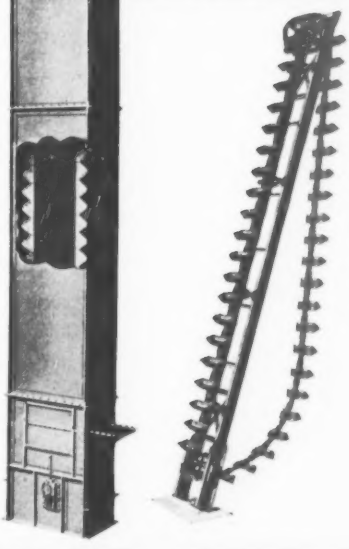
INTERNATIONAL HARVESTER COMPANY • CHICAGO

FIRST IN HEAVY-DUTY TRUCK SALES FOR 17 STRAIGHT YEARS

STANDARD BUCKET ELEVATORS

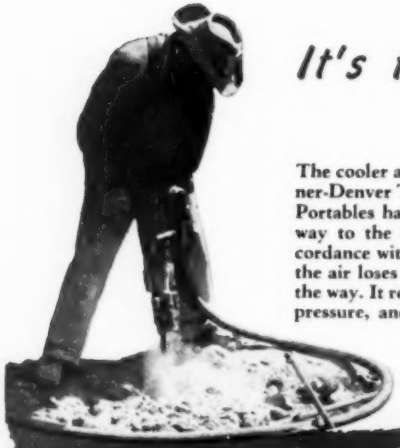


Standardized feature benefits you . . . saves time and expense of making layouts and complete drawings to suit each particular elevator. Also insures quicker delivery. Jeffrey bucket elevators can be furnished for vertical or inclined operation — with or without casing. Buckets of malleable iron, SUPERMAL or steel, mounted on chain or belt. Operating conditions, capacity or class of material make no difference . . . there is a Jeffrey bucket elevator to do the job. Also feeders, crushers, conveyors, chains, screens, car pullers, etc.



THE JEFFREY MANUFACTURING COMPANY
939 North Fourth St., Columbus 16, Ohio
ESTABLISHED 1877

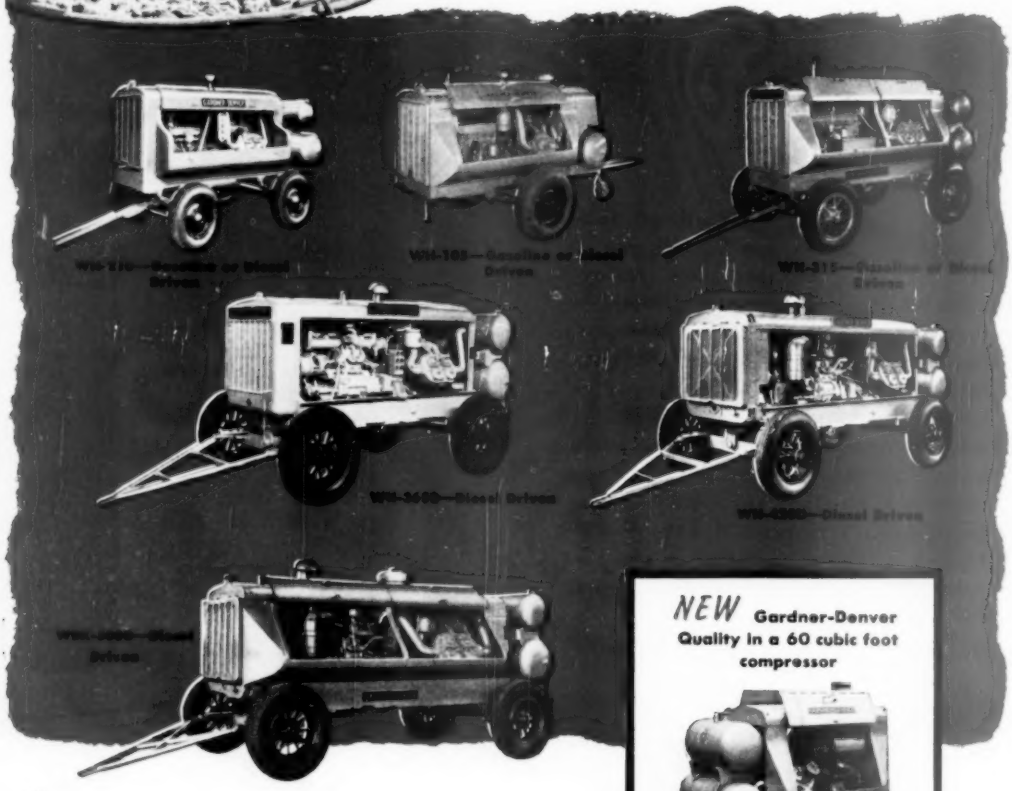
Complete Line of Material Handling, Processing and Mining Equipment



It's the pressure at the tool that counts!

The cooler air discharged from Gardner-Denver Two-Stage, Water-Cooled Portables has less heat to lose on the way to the tool. Therefore — in accordance with basic laws of physics — the air loses less of its pressure along the way. It reaches the tool at a higher pressure, and this vigorous air pressure lets every tool work at full capacity — full speed — full efficiency.

For a vigorous, steady, uninterrupted air supply — regardless of altitude, temperature or weather extremes — choose a Gardner-Denver Portable in the size to fit your needs. ***Write today for full information.***



GARDNER-DENVER

Since 1859

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada) Ltd., Toronto, Ontario

NEW **Gardner-Denver Quality in a 60 cubic foot compressor**

ADO-60—Utility Portable Air Compressor

How Utah Screens Solved Tough Soda Ash Sizing Problem . . .

SODA ASH (Na_2CO_3) is produced by burning limestone and salt with ammonia. It's a lumpy, easily crumbled, hard-to-screen material.

A large Midwest processor tried several makes of screens on this job. None were satisfactory. Particle size broke down excessively. Blinding of screen mesh required too much "time out." Maintenance was costly and screen cloth had to be replaced frequently. Then this battery of *Utah* electric screens was installed.

They were immediately successful — and here's why:

- *Finger-tip control* of amplitude of vibration provided close control of operation to suit fine sizing.
- Troublesome blinding, caused by clogging, near-size particles was practically eliminated. No frequent shutdowns to brush screen surfaces.
- Screen body and screen cloth vibrated as a unit . . . uniformly . . . assuring long screen cloth life.
- Maintenance negligible — no flexible reeds, springs or striking parts.

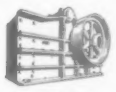
Soda ash is only one of many materials that can be screened successfully with modern *Utah* electro-magnetic vibrating screens. They're flexible enough in operation to handle a wide range of fine, granular materials from 10 to 48 mesh (dry) or 65 mesh (wet).

Utah screens come equipped with a *Vari-Pulse* non-blinding device which periodically increases vibrating amplitude from normal operating setting to maximum, momentarily, to clear screen mesh.

Get more facts about *Utah* screens from the A-C representative in your area. Or write for **Bulletin 07B7044.** Offices or distributors in principal cities in the U.S.A. and throughout the world.

A-2657

Kilns, Coolers, Dryers



Jaw Crushers

Hoists

Mills

Gyratory Crushers

Vibrating Screens

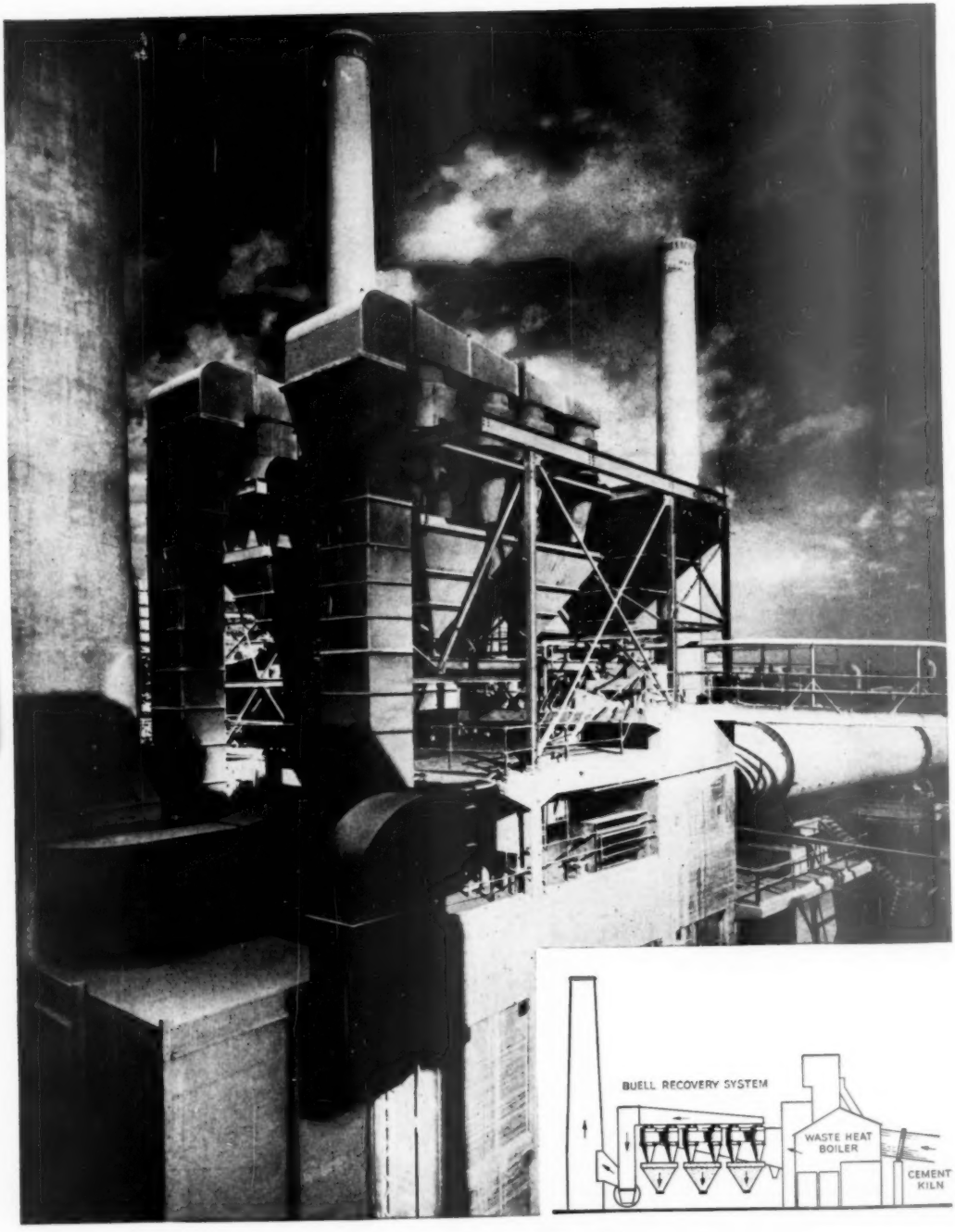
AND OTHER EQUIPMENT FOR THE CRUSHING, CEMENT AND MINING INDUSTRIES

ALLIS-CHALMERS, 975A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Vari-Pulse is an Allis-Chalmers trademark.

Buell



tops them all

IN KILN DUST COLLECTION

★ Buell Recovers More Dust

High Cyclone efficiency with a special ability to trap cement and rock dust fines... exclusive in the van Tongeren 'Shave-Off'... fits hand in glove with industry needs.

★ Buell Cyclones Don't Plug

Large diameter cyclones and outlets just won't plug. All cyclones operate at the same high efficiency ... even gas distribution prevents overloading some cyclones while others loaf.

★ Wear Resistant, No Maintenance

Heavy steel plate construction and large diameter cyclones cut the abrasive effect of rock dust to a minimum. Cost of shutdowns, clogging, and repairs at a practical zero.

On pulverizers, kilns, and stone dryers salvaged material alone soon pays for a carefully engineered installation. Send us your dust problem, or as a preliminary send for our latest catalog. Buell Engineering Company, 70 Pine Street, Suite 5085, New York 5, N. Y.

buell

Engineered Efficiency in DUST RECOVERY

MANUFACTURING IN THE UNITED STATES AND CANADA FOR SHIPMENT THROUGHOUT NORTH AND SOUTH AMERICA

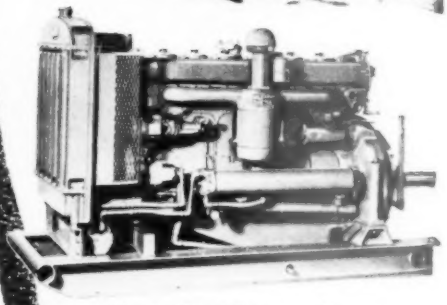
Profit by Lafayette County's experience!

2000 Tons of Crushed Rock Per Day on 66 Gallons of Fuel . . .

Lafayette County, Wisconsin, is proving daily that the best equipment pays for itself in reduced operating costs. The crushing plant illustrated above, for example, with a 90 H.P. (Cont.) Murphy Diesel on the primary and a 135 H. P. (Cont.) Murphy Diesel on the secondary, produces 900 cu. yds. of 1" material and 725 cu. yds. of ¾" material — a total of over 2000 tons — per nine hour day on only 66 gals. of economical diesel fuel!

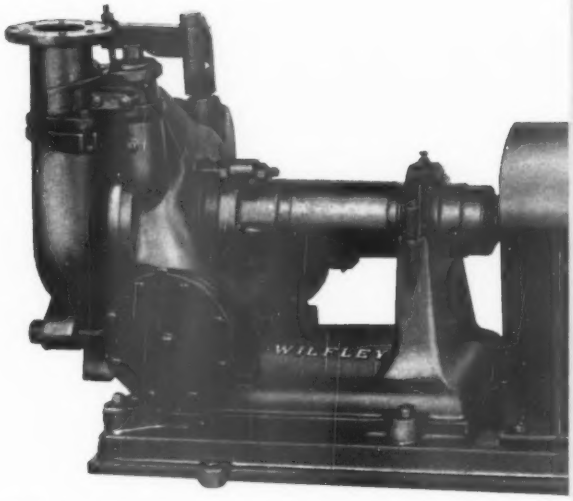
Mr. Geo. E. Alderson, Commissioner of Lafayette County, says of the set-up, *"We are sure glad we have the two Murphys on our crushing plant and I can say you make no mistake when you use Murphy Diesels . . . I am sold on the set-up all the way through."*

MURPHY DIESEL COMPANY
5315 W. Burnham St., Milwaukee 14, Wisconsin



Murphy Diesel Engines and Power Units are available in sizes from 90 to 220 H.P.; Generating Sets from 60 to 133 K.W. All models are "True" Diesel Engines featuring the famous Murphy Unit Injector. Ask your Murphy Diesel Dealer for full details or write direct.

MURPHY DIESEL



A Companion
to the Famous WILFLEY
Acid Pump

•

Buy WILFLEY for
Cost-Saving Performance

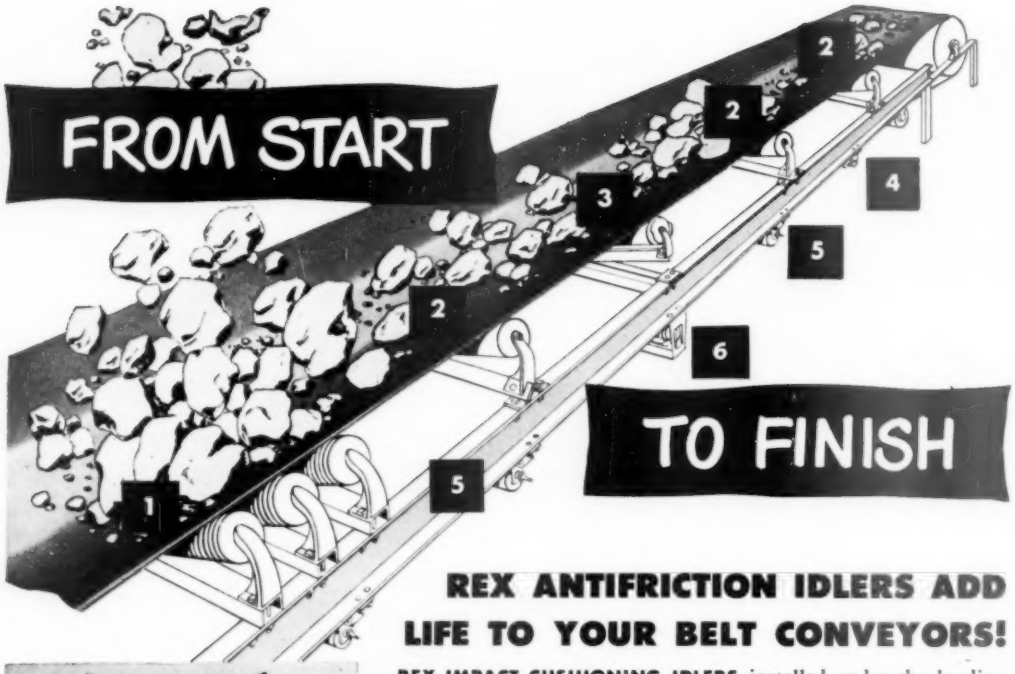
Rubber Parts for WILFLEY SAND PUMPS

Interchangeable with Rubber

Among other outstanding features, WILFLEY provides complete interchangeability of parts—from metal to rubber, or rubber to metal. This is only one of many WILFLEY improvements that create cost-reducing efficiency, stepped-up production, worthwhile power savings and complete dependability. In addition to rubber, WILFLEY wear parts are available in electric furnace iron and other materials individually engineered for every application. An economical size for every purpose. *Write or wire for complete details.*

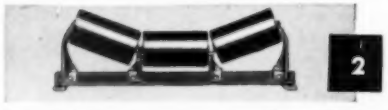
A. R. WILFLEY & SONS, Inc.
Denver, Colo., U. S. A.
New York Office:
1775 Broadway,
New York City

WILFLEY
centrifugal PUMPS



REX ANTIFRICTION IDLERS ADD LIFE TO YOUR BELT CONVEYORS!

REX IMPACT CUSHIONING IDLERS installed under the loading points will take the bumps for your belts . . . minimize ruptures and lacerations. Dual-purpose rubber rolls are scientifically molded with deep primary grooves for maximum cushioning and secondary grooves that provide surface softness to avoid belt laceration.

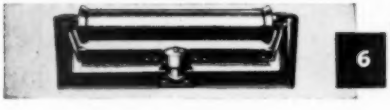


REX TROUGHING IDLERS insure minimum service cost and maximum equipment life. Belt friction wear is practically eliminated, and the closely spaced, well-balanced roll units provide an idler assembly that is kind to the belt. There is a type and style for every application.

REX SELF-ALIGNING TROUGHING IDLERS automatically align belts without the need for side-guide idlers that impose excessive belt edge wear. They eliminate the misalignments caused by off-center loading, side-wind drifting, warped frames or uneven belt stretch. These idlers fit any belt conveyor frame.

REX RUBBER-COVERED SPIRAL RETURN IDLERS create an ever-changing point of contact between belt and idler. Ice, abrasive, corrosive and sticky material cannot build up on the idler and cause premature wear and operating difficulties.

REX RETURN IDLERS are dead or live shaft type idlers with hydraulic type fittings for high pressure grease lubrication. They are sturdily built, and their smooth-rolling action cuts belt wear to the minimum.



REX SELF-ALIGNING RETURN IDLERS assure automatic belt alignment on the return run. They are similar in general design and effectiveness to the Rex Self-Aligning Troughing Idler.

For complete details on these and the many other idlers in the complete Rex line, write for your copy of Bulletin 463-R. Chain Belt Company, 1649 West Bruce Street, Milwaukee 4, Wisconsin.

CHAIN BELT REX COMPANY — BELT CONVEYOR IDLERS

You can depend on "EUCS" for MORE PROFIT IN EVERY PAYLOAD!

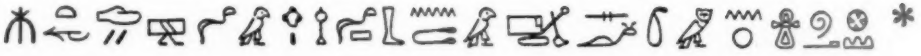
● Rear-Dump Euclids are designed and built to move rock, coal, ore and overburden and other heavy excavation at the lowest cost. Easy loading ... large capacity ... speed on the haul road and dump ... long life in heavy duty service ... these are some of the Euclid features that mean more pay in every payload.

There are models for every off-the-highway hauling requirement. Some of the variations in models that are available include five or ten speed transmissions ... semi-rigid or spring mounted drive axles ... manual or hydraulic booster steering ... standard or quarry type body.

Excellent parts and service facilities of a world-wide distributor organization are quickly available ... assure prompt, efficient service when needed. For full information on the Euclid line of earth moving equipment call or write today.

The EUCLID ROAD MACHINERY Co. Cleveland 17, Ohio

EUCLIDS



In any language, the synonym for excellence in excavator service is "Bucyrus-Erie," as this 120-B shovel, working in a limestone quarry near Cairo, Egypt, can testify. That's because Bucyrus-Erie quarry and mine shovels, like the 5 cubic yard 120-B, combine strength and durability with responsive Ward-Leonard variable voltage control for fast, precise operation and sustained high production. The simplicity of the 120-B's "years ahead" design means easy maintenance, minimum time out for repairs and elimination of useless deadweight that slows cycle speed. The result is maximum digging efficiency and outstanding performance through a long lifetime of profitable service. Other Bucyrus-Erie quarry and mine shovels from 2½ to 6½ cubic yard capacities.

*Translation:

The Best Buy Bucyrus . . .
The Best Buy in Excavators

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

STROH

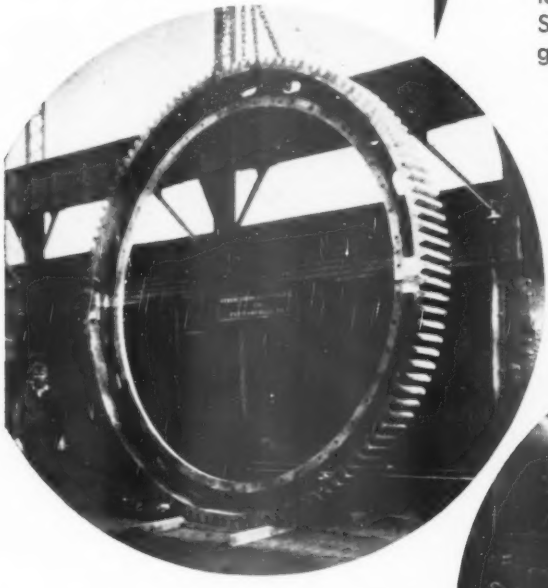
Steel Gearing
for
Dryers - Kilns - Coolers
Ball and Tube Mills

We have patterns for Gears and Pinions for practically all standard makes and sizes of Kilns, Coolers, Driers, Tube Mills, Rod Mills, Ball Mills, Crushers, and Preliminary Pulverizers.

Stroh Gears combine the abrasion resistant qualities of hard alloy with the shock cushioning advantages of soft steel.
Stroh Alloy applied to the contour of the gear tooth does these things —

Maintains original contour of Gear Tooth.
Maintains original back lash.
Cuts down replacements required.
Reduces loss of production from down time.

Stroh Alloy applied to the wearing surface of a plain carbon steel casting forms an integral part of the casting itself. It will not crack, chip, flow or spall off. Stroh Steel Gears can be shrunk on a Shaft without destroying the wear resistant properties of the Stroh Alloy.

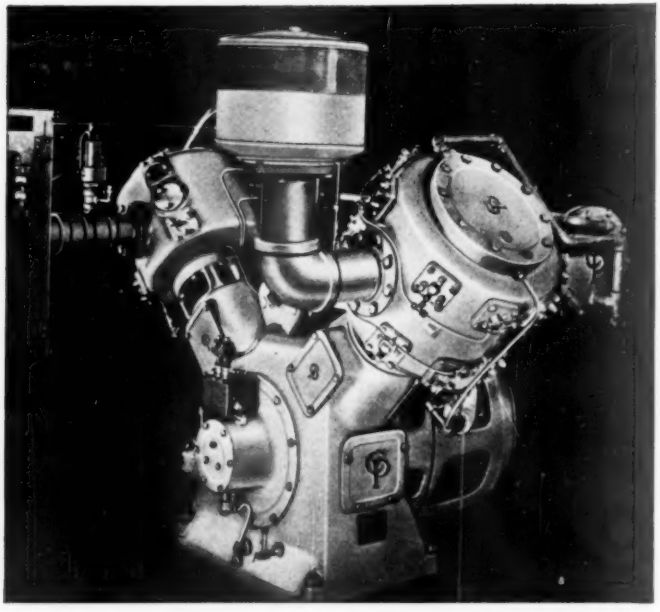


Top—Master Gear for 11' Kiln, 120 Teeth, 4¾" C. P., 16" Face, 181.43" Pitch Diameter.

Right—Shop set up of Master Gear and Pinion to insure accuracy. Master Gear for 10' Kiln—99 T, 5" C. P., 16" F. Pinion—16 T, 5" C. P., 16" F.

STROH
PROCESS STEEL CO.
PITTSBURGH (12), PA., U. S. A.

South American Representative
WALLACE YOUNG



here's the answer to restricted floor space

—the Type Y Compressor

While its compact design makes it ideal for close quarter installation—it has plenty of other outstanding advantages.

It is shipped intact as a "package unit," ready for external connections.

It requires only a simple foundation and no special skill is needed to align and install it.

It operates at high efficiency because of such valuable features as large area Simplate valves, multi-step capacity regulation, effective inter-cooling, precision bearings and force-feed lubrication.

And finally it's extremely easy on maintenance.

Available with built-in or direct-coupled motor, or with V-belt drive, in capacities of 500 to 900 c.f.m., at 80 to 125 pounds pressure. Sizes for other pressures also furnished.

Write for full information.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

GET THE RIGHT BREAKAGE WITH THE RIGHT EXPLOSIVE ...AMERICAN

Increased tonnage of properly sized material . . . along with maximum control of placement . . . are just two of the benefits you can count on when you use AMERICAN explosives. Available in a complete range of strengths, velocities and densities, AMERICAN explosives are designed to meet efficiently any field problem.

And the intensive research, quality control and modern manufacturing techniques behind all AMERICAN explosives and blasting supplies are your assurance of maximum dependability, safety, speed and all-around economy under any conditions. Whatever your requirement, there is an AMERICAN explosive to meet it.

• *Capable field engineers are available at your call*

• HIGH EXPLOSIVES • PERMISSIBLES

• BLASTING POWDER • BLASTING ACCESSORIES

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EXPLOSIVES DEPARTMENT

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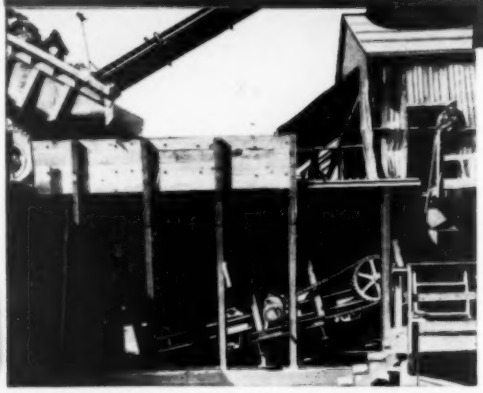
TELSMITH

more economical feeders



NEW ENTERPRISE STONE & LIME CO., ASHCOM, PA.—36-in. x 10-ft. Telsmith Heavy Duty Apron Feeder takes 15-ton loads; feeds a 25-B Telsmith Primary Crusher.

● Keep your conveyors, screens and crushers working smoothly and at full capacity. Telsmith Apron or Plate Feeders insure steady, uniformly regulated flow of material to entire plant—boost your output and cut cost of up-keep.

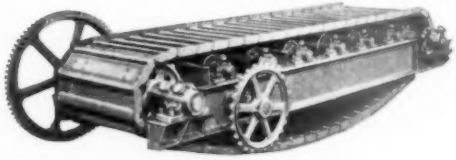
APRON FEEDERS are self-contained units on heavy structural steel frames. **Heavy-Duty Apron Feeders**—with carbon, or manganese steel flights—handle the toughest jobs, such as feeding primary crushers, either jaw or gyratory. **Standard-Duty Apron Feeders**—equally sturdy, but weigh less. Apron Feeders are made in 24-in. to 72-in. widths, with capacities from 25 to 700 tons per hour. Furnished with heavy steel hoppers, at extra cost.

PLATE FEEDERS are simple in design—sturdy in construction. Adjustable stroke regulates capacity. Made in both Standard and Heavy-Duty models; widths 16-in. to 48-in.; capacities 12 to 400 cu. yds. per hr.

Send for Bulletin F-11

F-I.

TELSMITH Standard PLATE FEEDER with special back gear shaft and drive pulley equipment at extra cost.



TELSMITH Standard-Duty APRON FEEDER—Raised edges of its ¾-in. steel flights prevent spillage.

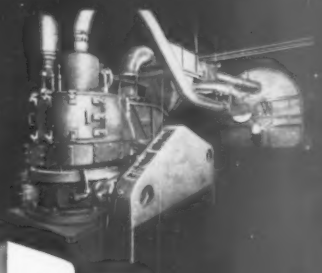
SMITH ENGINEERING WORKS, 508 E. CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

Cable Address: Sengworks, Milwaukee

51 East 42nd St. New York 17, N. Y. • 211 W. Wacker Drive Chicago 6, Ill. • 713 Commercial Trust Bldg. Philadelphia 2, Pa. • 238 Main Street Cambridge 42, Mass. • Boehck Eqpt. Co. Milwaukee 3, Wis. • Brandeis Mach. & Supply Co., Inc. Louisville 8, Ky.

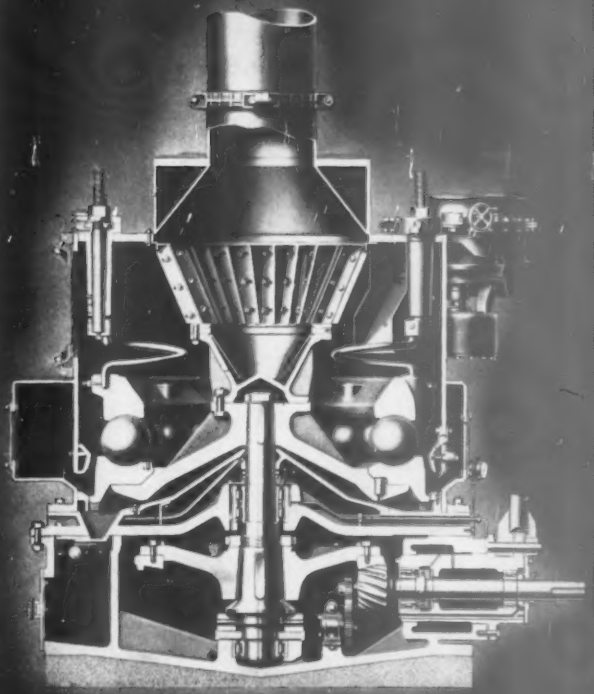
Clyde Equipment Co., Portland 9, Ore., & Seattle 4, Wash. • General Machinery Co., Spokane 1, Wash. • Interstate Equipment Co., Statesville, N. C. • Rish Equipment Co., Charleston 22, & Clarksburg, W. Va.—Roanoke 7, & Richmond 10, Va. • Wilson-Weesner-Wilkinson Co., Knoxville 8, & Nashville 6, Tenn.

DEPENDABLE



because it's built to LAST

Operating records prove that the B&W Type E Pulverizer, employing the ball-bearing principle of grinding, provides high availability and dependable, trouble-free service.



proved at 139 installations

BABCOCK & WILCOX

Here is Plain PROOF...

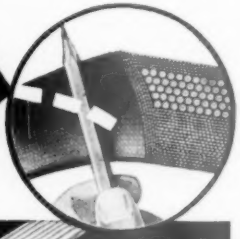
You can actually *feel* the sides of a belt *change shape* as the belt bends.

That the

CONCAVE SIDE

(U. S. Patent No. 1813698)

SAVES Transmission DOLLARS



When a *straight-sided* V-Belt bends around a pulley, three things are bound to happen.

(1) The top of the belt, being under tension, *narrows*. (2) The body of the belt, under compression, *widens*. (3) The sides of the belt *bulge out*.

These *shape changes* are inevitable. They are shown in figures 1 and 1-A, below.

Straight-Sided V-Belt.

How Straight-Sided V-Belt Bulges In Sheave-Groove.

Because this bulging belt does not fit the sheave groove, two facts become clear. (1) The belt will get excessive wear where it bulges—*shorter life!* (2) The whole side of the belt cannot *uniformly* grip the pulley—*a loss in drive efficiency.*

How different the V-Belt with the precisely engineered *concave* side (U.S. Patent No. 1813698)—the Gates Vulco Rope. As this belt bends it assumes a shape that *exactly* fits the sheave groove. (Figures 2 and 2-A, below.)

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit In Sheave-Groove.

Two savings result. (1) The Gates Vulco Rope wears evenly—*longer life!* It's entire side-wall grips the pulley—no slip—*full delivery of power!*

The Mark of SPECIALIZED Research

The Concave Side is MORE IMPORTANT NOW Than Ever Before

Because the sides of a V-Belt are what actually drive the pulley it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

Now that Gates *SPECIALIZED* Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

418

GATES VULCO ROPE DRIVES

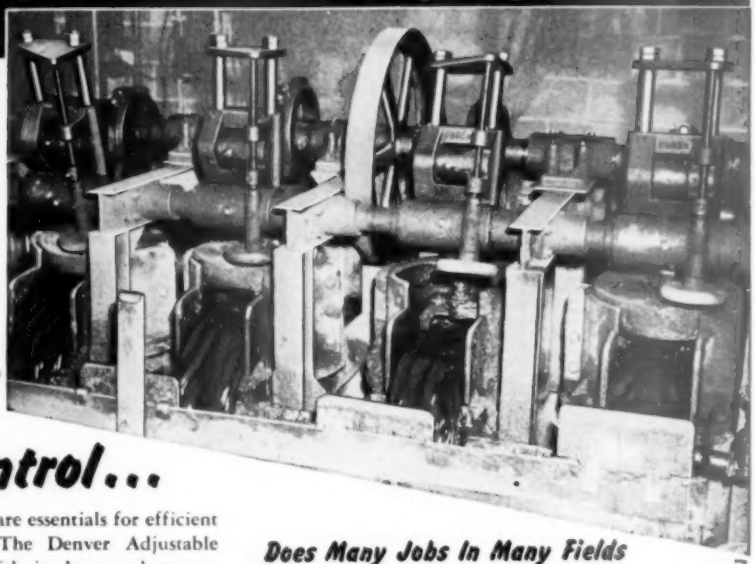
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY
DENVER, U.S.A.
"The World's Largest Makers of V-Belts"

Control Large Volumes of Pulp

WITH A

Denver *Adjustable Stroke* Diaphragm Pump



This 6" Quadruplex Denver Adjustable Stroke Diaphragm Pump is doing a real job at the Tamaqua Colliery of the Lehigh Navigation Coal Company, Inc.

Material... Minus 6 mesh washery refuse (Underflow from 75' diameter Denver Hydroclassifier)

% solids in pulp... 35-45
Gallons pulp per min.... 600
Tons solids per 24 hrs.... 1450-2000

Density Control...

... and pulp flow regulation are essentials for efficient industrial plant operation. The Denver Adjustable Stroke Diaphragm Pump, with its large volume capacity, ease of control, and rugged, long wearing construction, is an ideal unit for heavy duty "24-hour service."

Hand Wheel Controls Pulp While Pump is Running

Simply turning the adjustable hand wheel changes the length of stroke and immediately alters the pulp flow to the required amount, *while the pump is operating.*

Rugged Construction Gives Long Life And "24-Hour Service"

The Denver Adjustable Stroke Diaphragm Pump is sturdily built to give trouble-free service. Molded rubber valve seats and diaphragms are long wearing and may be quickly replaced with a minimum of shutdown time.

Does Many Jobs In Many Fields

In coal washing... in copper, phosphate, potash and other concentrators... and in industrial plants... large volumes of pulp are being handled "24 hours per day," month after month with these heavy duty Denver pumps.

Wide Range of Sizes, Large or Small Capacities

Sizes range from 2" to 6" in Simplex, Duplex, Triplex or Quadruplex units.

A 6" Quadruplex Pump, handling 60% solids at 4.2 specific gravity, has a rated capacity of 3,140 tons per 24 hours. A 2" Simplex Pump under similar conditions has a rated capacity of 80 tons per 24 hours.

Let us help you solve your pumping problems. Write today for Bulletin P8-B for additional information on the Denver Adjustable Stroke Diaphragm Pump. Other bulletins also available on a complete line of ore dressing equipment.

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

"The firm that makes its friends happier, healthier and wealthier"

DENVER EQUIPMENT COMPANY

1410 17TH STREET • DENVER 17, COLORADO

DENVER • NEW YORK CITY • CHICAGO • EL PASO • TORONTO • VANCOUVER • MEXICO CITY • LONDON • JOHANNESBURG • RICHMOND, AUSTRALIA

All Muscle ...no fat

3½-yard ESCO Cast-Welded Dipper on Lima 1201 with 32'6" boom, and 22' dipper stick, excavating sand and gravel in California quarry.

Strength to lick tough jobs, but without useless weight to slow down your digging—that is the story of the *ESCO* Cast-Welded dipper bucket shown here. It means that full fighting strength remains after excess weight has been engineered out. Or, in terms of your digging jobs, it means

Greater Capacity per Pound

More Passes a Day

More Payload per Pass

A close inspection of these buckets points out the basic reasons for the performance of *ESCO* Cast-Welded dippers. It shows

Manganese Steel for Wearing Parts

Cast Alloy Hollow Back Beams

Flaring Outside Teeth for Full Bite

Streamlined Dipper Front

Tapered Box for Easy Loading and Quick Discharge

Let your nearest *ESCO* representative tell you about this all-muscle-no-fat dipper bucket. Or fill in and mail the coupon for illustrated literature. Electric Steel Foundry, 2177 N.W. 25th Avenue, Portland 10, Oregon. 726 Porter Street, Danville, Illinois. Offices in Pottsville, Pa.; Eugene, Oregon; Chicago; Honolulu; Houston; Los Angeles; New York City; San Francisco; Seattle and Spokane. In Canada, *ESCO* Limited, Vancouver, B.C.

ESCO

Dragline, Dipper and Coal Loading Buckets

ELECTRIC STEEL FOUNDRY
2177 N.W. 25th Avenue, Portland 10, Oregon
Please send catalog on your Cast-Welded Dipper Buckets to:

Name_____

City_____ State_____

Address_____ Zone_____

Make and model of machines used_____

Pioneers in Conveying Dry

Fuller Company holds a unique position in the field of conveying many materials with air, much of its equipment being used in practically all parts of the industrial world.

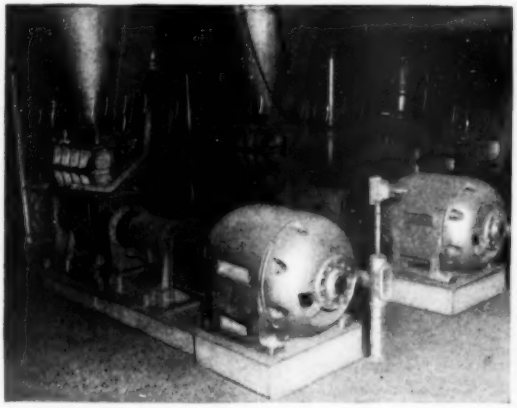
FULLER-KINYON CONVEYING SYSTEM: This system was the first to convey, with air, pulverized coal, in a clean and efficient manner, without explosion and fire hazards, so prevalent in previously used mechanical systems; also cement raw materials, and finished Portland cement. Today over 96 percent of the Portland cement plants in the United States use one or more Fuller-Kinyon Systems for conveying cement raw materials and finished cement, while many plants still use this system for conveying pulverized coal to dryers and rotary kilns.

FULLER-FLUXO SYSTEM: Recommended for conveying Portland cement over extremely long distances. This equipment was used on many large dams constructed in recent years, such as, Hoover, Shasta, Friant and Grand Coulee. On the latter project, cement was conveyed from storage to mixing plant, a distance of approximately one and one-quarter miles.

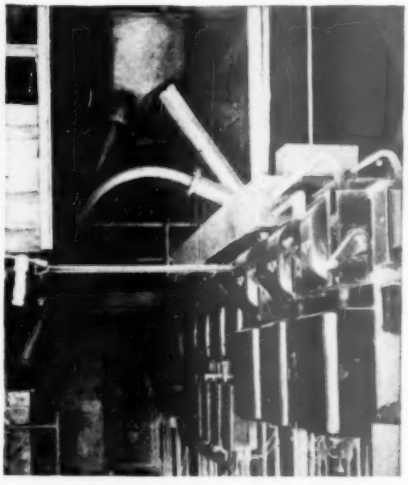
AIRLIFT . . . CONSTANT-HEAD FEEDER: This device is employed for elevating, conveying and feeding dry pulverized materials which have been placed in a semi-fluid state by means of aeration. When used only for elevating materials, it is designated as an Airlift. When it is used to deliver material to a screw feeder, rotary feeder, or spout, in such a manner that a constant head of material exists above such equipment, it is designated as a Constant-Head Feeder.

F-H AIRSLIDE: The most recent acquisition to the Fuller family, is a most unique conveyor for transporting fine, dry materials, without the use of moving parts. Nothing moves but the air and material. Materials really flow like water. Aerated with low-pressure air, materials flow, by gravity, on a slightly inclined porous surface. It comprises a lower channel, forming an air chamber, having an upper surface of porous material, usually a heavy fabric, upon which the material flows in an upper channel. A novel feature of the design is the porous surface of low-air permeability, which assures uniform distribution of low-pressure air.

This equipment has been used to convey materials, such as, gypsum, soda-ash, baryte, bentonite, flour, lime, fly-ash, iron ores, Portland cement and cement raw materials.



Two Fuller-Kinyon Stationary Pumps, in a cement plant in the West, for conveying Portland cement from mills to storage. Fuller Rotary Duplex Single-stage Compressor, which furnishes air for conveying, shown in background.

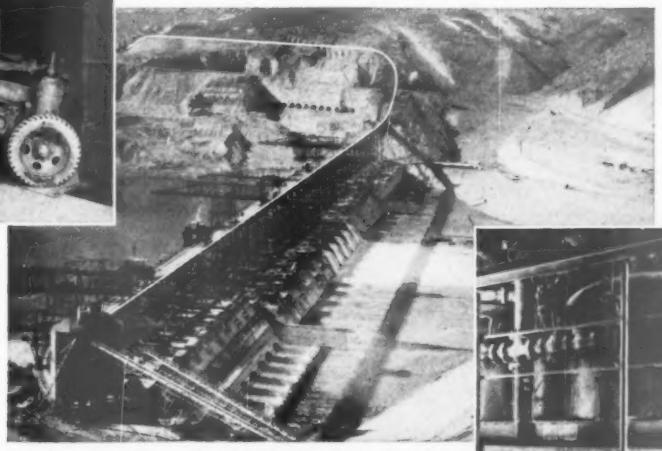


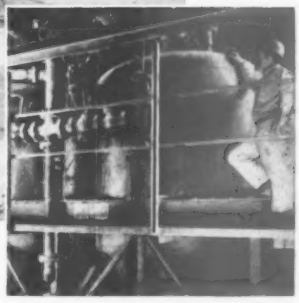
Fuller Airlift conveying finished Portland cement from a Fuller Cement Cooler to a Fuller-Kinyon Pump. This Airlift was installed to go up and over the electrical starting switches shown at right, due to the fact that no conveyor could economically be placed underneath, because of conduits installed in the concrete foundation and floor.

Fuller **EQUIPMENT FOR BETTER OPERATION**

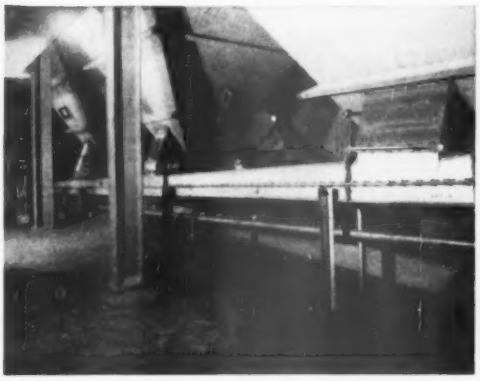
Fuller-Kinyon, Fuller-Fluxo, Airveyor, F-H Airslide Conveying Systems . . . Rotary Feeders and Valves . . . Rotary Compressors and Vacuum Pumps . . . Inclined-Grate Cooler . . . Pulverized Material Cooler . . . Material-Level Indicator . . . Aeration Units . . . Airlift . . . Constant-Head Feeder . . . Slurry Valves . . . Motion Safety Switch . . . Samplers

Pulverized Materials with Air





Fuller-Fluxo Conveying System at Grand Coulee Dam. White line shows approximate location of conveying line from storage bins to mixing plant, lower left of photo. Right: Fuller-Fluxo Pump used at Grand Coulee. Upper left: Fuller Remote-Control Unloader unloading cement from box cars and conveying to storage bins.



Fuller-Huron Airslide conveying Cottrell precipitator dust in a cement plant. The Airslide replaces the screw conveyor, shown below and back of the Airslide.

Fourteen-inch Airslides conveying finished raw material from nine separators, total capacity 225 tons an hour. This photo illustrates the adaptability, flexibility, and simplicity of an Airslide installation. Note simple supports, and the ability to make a change in direction.

G-57T

FULLER COMPANY

CATASAUQUA — PENNSYLVANIA

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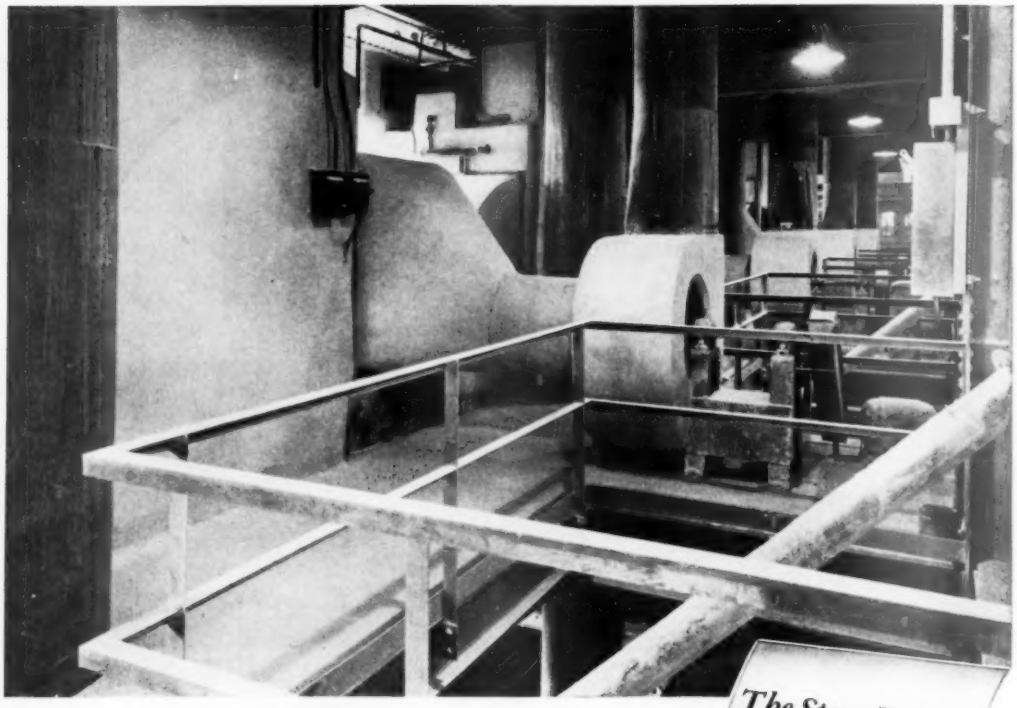


KOPPERS-ELEX PRECIPITATOR RECOVERS MORE GYPSUM THAN GUARANTEED!

The Story Behind **KOPPERS-ELEX** *Performance* **GUARANTEE**

A LARGE gypsum plant, faced with the problem of controlling the disadvantage of gypsum dust, chose a Koppers-Elex Precipitator. Outstanding performance in excess of guaranteed results was obtained.

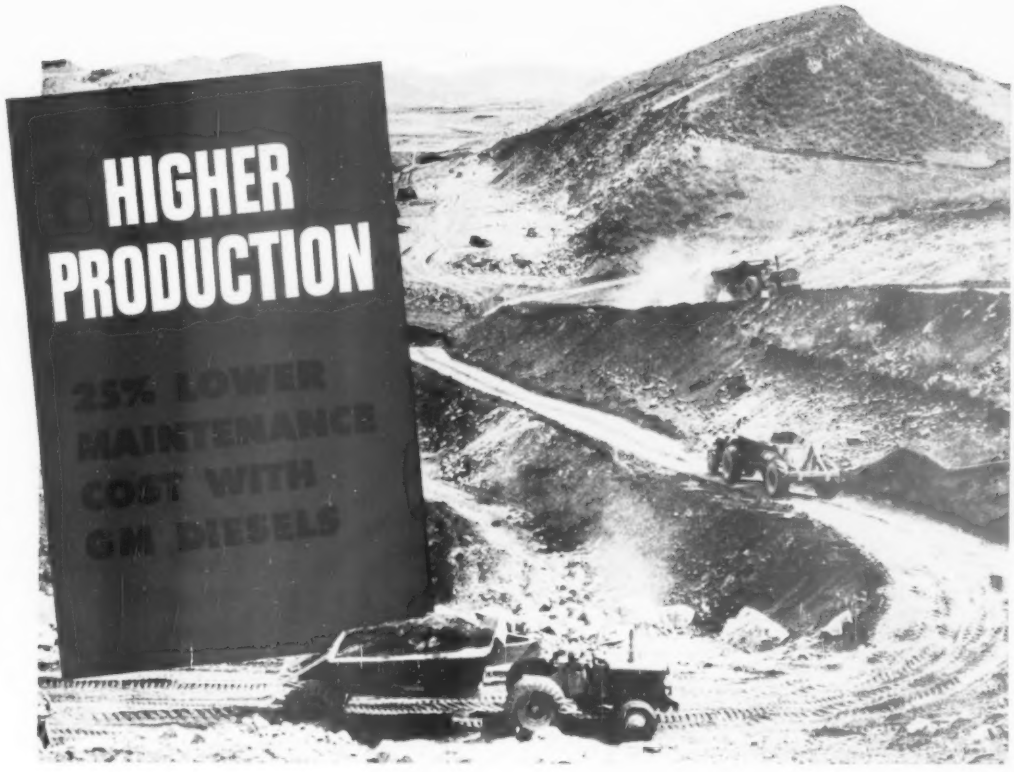
Under standard (A.S.M.E.) tests conducted during actual operating conditions, the precipitators on four calcining kettles limited residuals to .07 grain per cubic foot of gas—and the overall efficiency on the precipitators installed on the rock drier averaged 99.30%.

This performance, which exceeds the guarantee, is typical of Koppers-Elex operation. Correct design and precision engineering, coupled with the experience gained from over 1000 successful installations, give superior results in the recovery or removal of materials from gases. For the same superior performance in your plant, specify Koppers-Elex — designed, engineered, built, installed and guaranteed by Koppers...*with 111 years of reputation-building integrity behind it.* Koppers Co., Inc., Koppers-Elex Precipitator Department, 248 Scott St., Baltimore 3, Maryland.

1st with Industrial Gas Cleaning Equipment

Koppers-Elex KOPPERS

ELECTROSTATIC PRECIPITATOR



HIGH altitude and long haul grades are no problem with General Motors Diesels on the job. That's the profitable discovery made by Grafe-Callahan Company of Fort Collins, Colorado, on the 2½ million cubic yard Horsetooth Dam project on the East slope of the Rockies near Denver.

On the Horsetooth job (altitude 5300 feet) GM Diesel-powered Euclid trucks hauled 11½ yard (19½-ton) loads of wet gravel up 10% grades on 6-mile round trips averaging two trips per hour.

Starting with two GM 6-71 Diesel replacement engines, Grafe-Callahan purchased 8 new GM Diesel-powered Euclids and finally converted all 16 of their units to General Motors 2-cycle Diesel power.

Job manager Joe Seabury—a man whose opinion is worth noting—states, "I am being very conservative when I say that our maintenance costs have been cut 25% since we switched to GM Diesels. They stand up better and are much easier to work on. They have given us very good performance on this job."

When you need earth-moving machinery, or any heavy construction equipment, look to the *power*. Insist on GM Diesels and get more work done at lower cost. Write us or ask your construction equipment distributor for details.

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SINGLE ENGINES... Up to 200 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS... Up to 800 H.P.

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DIESEL BRAWN WITHOUT THE BULK

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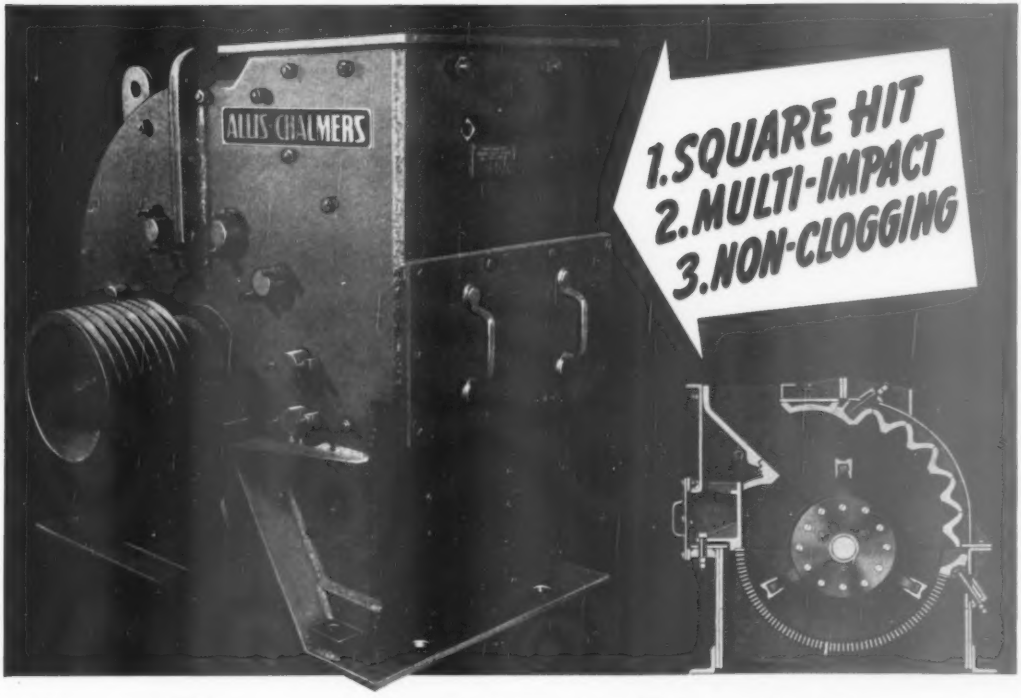


Get Fine, Cubical Particles in One Pass with *Pulverator!*

A SQUARE HIT is the most powerful breaking blow. The *Pulverator* hammer mill utilizes this important principle of impact crushing — it's designed so that revolving flat hammers hit each bit of feed *squarely*.

"MULTI-IMPACT" PRINCIPLE

Not only that — feed is hit *repeatedly* in the *Pulverator*. A succession of involute breaker plates is so arranged that material rebounds from hammers to plates several times. Repeated square blows . . . not glancing blows . . . break up the material thoroughly.

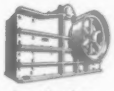
Feed particles are completely sized when they get to the bottom of the *Pulverator* . . . fall through grate bars readily. Power and maintenance factors are reduced materially because hammers do not drag through accumulated oversize on bottom of the machine.

CHECK THESE IMPORTANT FEATURES

- Renewable liners, breaker plates, hammers, hammer arms, grate bars.
- Hammers, grate bars also reversible.
- Grate bar spacers provide for product size adjustment.
- Removable doors . . . easy to service hammers, grate bars, rotor.

Five sizes handle up to 6-inch non-abrasive materials; capacities 2½ to 125 tons per hour. Get more facts from the A-C representative in your area, or write for Bulletin 07B6265. Allis-Chalmers offices or distributors in principal cities in the U. S. A. and throughout the world. A-2725

Kilns, Coolers, Dryers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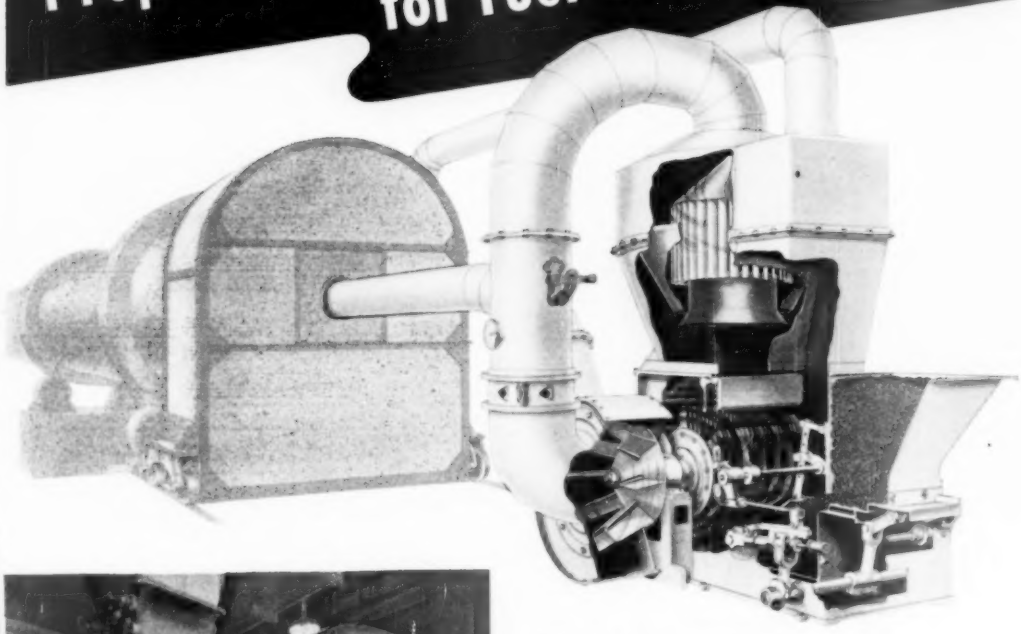

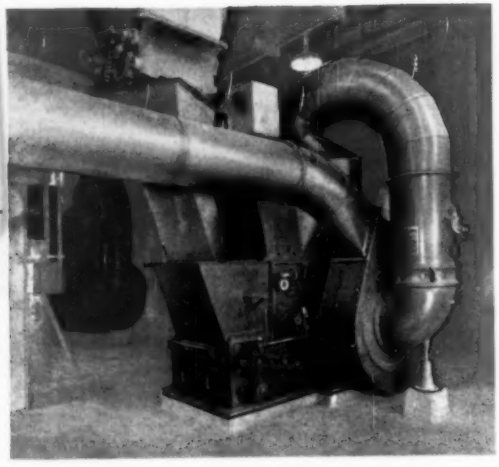

Two 10,500 lbs./hr. pulverizers installed in MARQUETTE CEMENT's Nashville, Tenn. plant.

STRONG-SCOTT Unit Pulverizers are sold on a guaranteed rated-capacity basis which provides ample leeway in output, should they be forced to grind low-grade or "distressed" coal. Whether the moisture and ash content be high, or the grindability be low, the *full rated* output will be *continuously* obtainable.

These pulverizers, through which passes 30-40% of primary air, preheated, have a moisture-evaporating capacity obtainable by no other direct-firing mill.

Grinding by air-attrition, ample clearances in the grinding chamber, ample drop-out space for tramp-metal, all combine to assure positive feeding and freedom from clogging of wet fuel.

The STRONG-SCOTT Unit Pulverizer is the *best insurance* against operating and maintenance troubles, lowered capacity, or service interruptions *incident to post-war fuels.*

Ask any cement plant superintendent who owns one!

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Millions of tons of minus 10" crushed stone with fines have been conveyed by this belt in the last 7 years.

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The fine performance record of this belt is due to closely coordinated planning by engineers representing operators, equipment manufacturers, and engineers of the United States Rubber Company. This "Three-Way Engineering" can produce results for you. Whether the installation is large or small, lower cost haulage, larger and steadier output over a longer period of time are assured.

When you plan a new conveyor system, or when you wish to replace your present belt, get in touch with United States Rubber Company engineers. They will help you solve your belt haulage problems. Write Mechanical Goods Division, 1230 Avenue of the Americas, New York 20, N. Y.

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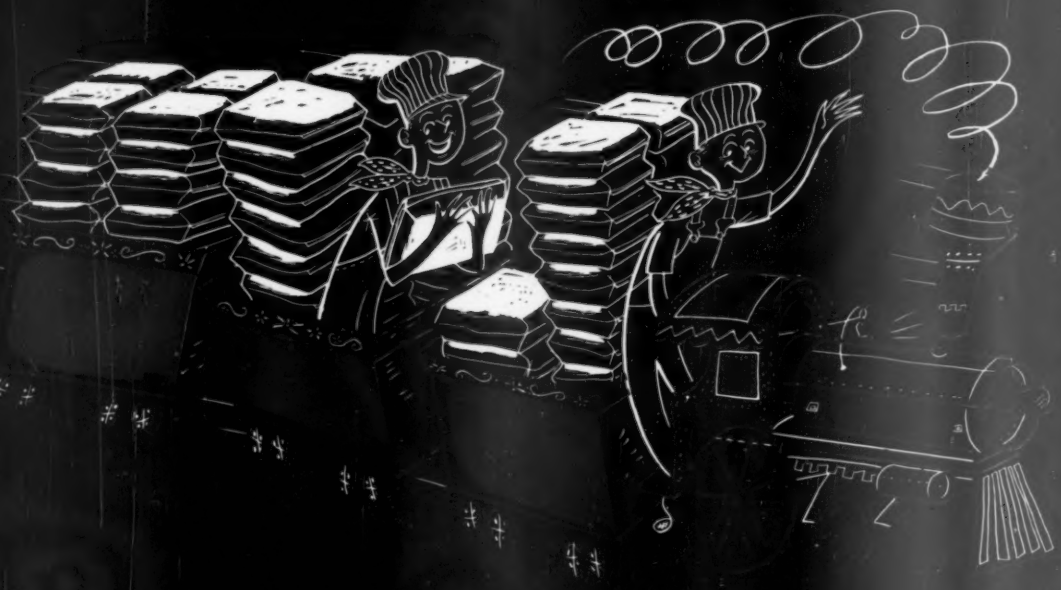

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HAISS BUCKET LOADER with swivel belt conveyor provides greater reach and greater discharge height. Range of discharge is within arc of 180° as conveyor swivels around head of boom.

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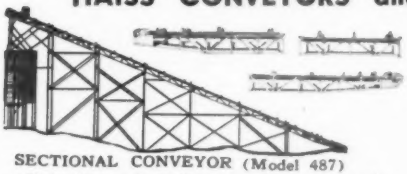

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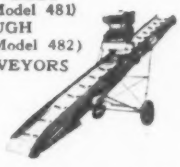

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Heavy Duty or Light Duty Buckets for high speed excavating or rehandling of all types of material. Quick opening. Quick discharge. All sizes.

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11 WEST 42ND STREET — ENGINEERS AND MACHINERY MANUFACTURERS — NEW YORK, N. Y.

"WE HEAR..."

August, 1949

Marshall Plan orders for American-made industrial machinery and equipment may be expected to increase by at least a quarter billion in the coming 12 months under current programming, Iron Age reports. Tool purchasing authorizations will be increased from the first year's $30,000,000 to $45-$50,000,000.

* * * * * * * * *

Applications for FHA insurance of mortgages on newly-constructed one- to four-family homes, reported for May of this year, broke all records for activity under section 203 of the National Housing Act. The 31,018 dwelling units covered by these applications represented an increase of some 4 percent over the comparable figure for April, which was the previous all-time high. On the basis of preliminary figures, now available, it would appear that the June volume for unit applications will exceed those for May if the present trend continues.

* * * * * * * * *

The Ohio Turnpike Bill, under which a toll road is permitted to be built across the State of Ohio connecting with the Pennsylvania Turnpike, and very likely an additional toll road from the Ohio River to Lake Erie, has been passed by the House and Senate of Ohio.

* * * * * * * * *

An employer sometimes can get the National Labor Relations Board to set aside the result of a collective-bargaining election if an agent of the winning union makes an implied threat against an employe during the pre-election campaign. In its first decision of this kind under the Taft-Hartley Act, the Board holds that a threatened worker was coerced and denied freedom of choice in the election.

* * * * * * * * *

When it comes to measuring the growth record of various industries, since 1939, the machinery industry registered the largest increase--300 percent in value and 140 percent in employment.

* * * * * * * * *

A portion of the lower jaw of an Archid Iskodon (prehistoric animal) was uncovered in the gravel pit of the Coolidge Sand and Rock Co., Coolidge, Ariz. The bone, or lower mandible to some, was on the conveyor belt on its way to the crusher when it was spotted by the plant superintendent, who saved it from destruction.

* * * * * * * * *

According to F. W. Dodge Corp., dollar valuation of contracts awarded by the end of May this year in the 37 states east of the Rocky Mountains for building and construction by public agencies was running at a level 19 percent higher than in the comparable period last year; while private contracts were down 20 percent in comparing the same periods. Public-account contracts totaled $1,380,812,000 for this period; while private-account contracts declined to $2,141,188,000 this year from last year's $2,671,047,000.

* * * * * * * * *

The Washington State Highway Department plans to spend $2,500,000 during the next two years for the planning and construction of a 4-lane highway over Snoqualmie Pass in northwest Washington.

WE HEAR

With 1949 requirements remaining substantially unchanged from the 1948 level, it is expected that gypsum board and lath will be in fairly easy supply this year, the Department of Commerce states in a special report forecasting the 1949 consumption of building materials for construction purposes.

* * * * * * * * * *

A top government building official predicts that there will not be an "appreciable falling off" in volume of the construction industry before the third or fourth quarter of 1950.

* * * * * * * * * *

Mine-roof "sky-hooks" are being manufactured by Oliver Iron & Steel Corp. of Pittsburgh which tie together several layers of rock or slate so that the roof will support its own weight. The anchoring bolts (about 4 ft. long, 1 in. in dia.) are fed into holes drilled up through the mine roof.

* * * * * * * * *

Employers cannot safely raise the wages of employes during contract negotiation without giving the bargaining union an opportunity to accept or reject the proposed increase. The Supreme Court upholds a ruling of the N.L.R.B. that a company was guilty of unfair labor practices when it raised the pay of some workers more than had been offered to the union during its negotiations.

* * * * * * * * *

One of every 25 new permanent single-family dwellings started last year (in non-farm areas) was a prefabricated house, according to the Prefabricated Home Manufacturers' Institute. Members of the prefab industry shipped 30,000 permanent-type homes during 1948.

* * * * * * * * *

With only seven percent of the world's population, the United States uses 70 percent of all the oil produced on the globe and 50 percent of all the minerals, Bureau of Mines Reports.

* * * * * * * * *

Costs of building single-family houses and large-type buildings in the nation as a whole declined 5 percent between May 1, 1948 and May 1 of this year, according to a survey by F. W. Dodge Corp. Costs are expected to decline another 8 percent by November of this year.

* * * * * * * * *

When rain hampered construction activities of R. F. Warry, England, he developed a "builder's umbrella" which is said to be saving him hundreds of man-hours. The "keep dry while you work" idea consists of a roof made of corrugated iron and supported by a steel frame which is placed over a house when it is being built; and work can go on even during heavy rain.

* * * * * * * * *

A survey by Engineering News-Record shows that workers' productivity is rising. Contractors report that their men are turning out more work each hour, probably due to a smooth flow of materials as well as new materials and methods. The result is lower construction costs.

* * * * * * * * *

The N.L.R.B. will not always regard two plants of one management as a unit, even though they may be on one payroll. A collective bargaining election may be ordered in one plant only.

* * * * * * * * * *

Defense housing will cost $623,000,000, Engineering News-Record reports. For the first time in history, Congress has received a single, unified request for appropriations (totaling the $623,000,000) to meet the fiscal 1950 housing and public works requirements of all the armed services.

THE EDITORS

MACHINERY FOR
CEMENT—LIME—ORES

F. L. SMIDTH & CO. Manufacture the Following Complete Line of Modern Machinery for Cement, Lime and Allied Materials, the Sintering of Ores, etc.

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ROTARY KILNS for cement, lime, ores, etc.

UNAX KILNS, with integral cooler.

SUCTION GRATE ROTARY KILN.

ROTARY KILNS—Sintering and roasting.

PRE-HEATERS for rotary kilns.

UNAX COOLERS, cooling drums on kiln.

UNAX GRATE COOLER, air quenching.

UNAX PRE-COOLER.

F.L.S. MULTI-TUBE ROTARY COOLER.

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COOLERS, Cement Ores, etc.

CHAIN SYSTEM for wet kilns.

HEAT EXCHANGERS for dry kilns.

KILN CONTROL, electrical.

GAS ANALYZER, electrical.

KILN EQUIPMENT, fans, hoods, dampers, spouts, airseals, dust chambers, multiple gas discharge.

FLUXO PACKER for filling bags.

EXBINER for discharging bulk cement.

EXTRACTORS, cement from silos.

SKIPULTER shaker conveyor.

CYLCUP distributing conveyor.

PNEUMATIC FEEDERS.

SLURRY FEEDERS for kilns and mills.

CRADLE FEEDERS for coal, rock, clinker.

TABLE FEEDERS for coal, rock, clinker

COAL FEEDERS for rotary kilns.

COAL BURNERS for rotary kilns.

GAS BURNERS for rotary kilns.

OIL BURNING EQUIPMENT for kilns.

SYMETRO Drive, speed reduction units.

PUMPS for heavy liquids as cement slurry.

FLOURMETER for determining micron sizes and finely ground cement, etc.

PLANT ENGINEERING

F. L. Smidth & Co. are also engineer specialists in designing and equipping factories for making Portland cement and other allied materials, having devoted their efforts along these lines for a period of over fifty years.

Their engineering services include all stages of the project from the preliminary investigation of the site and raw material deposits, chemical and physical tests of the raw materials and finished product, to all necessary drawings and specifications for erecting and equipping all departments of the plant, including also the electrical engineering.

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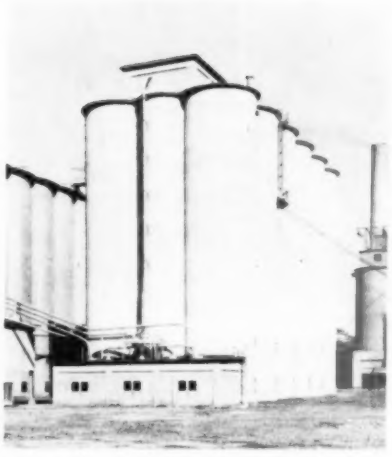

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MACDONALD
Modern Methods

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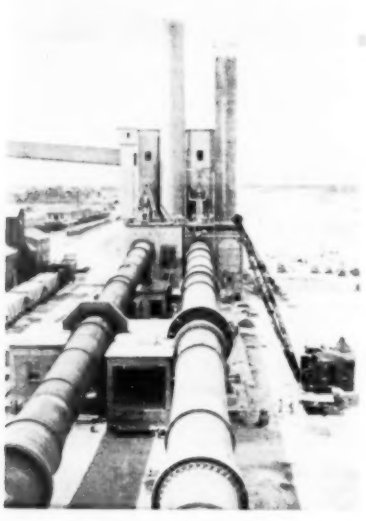

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Specializing in service to the nonmetallic-minerals industry, MACDONALD provides *unit responsibility* in plant engineering, design and construction.

Our experience—based upon many successful world-wide projects in Mexico, China, Europe and the United States for 54 years—can provide effective and economic solutions to installation and production problems.

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TOP-VOLUME PRODUCTION BRINGS YOU TOP-VALUE FEATURES!

Chevrolet's new 4-SPEED SYNCHRO-MESH TRANSMISSION offers quicker, quieter and easier operation. Double clutching is eliminated because the gears are always in mesh. Faster shifting maintains speed and momentum on grades. Available in series 3800 and heavier duty models.

Chevrolet's power-packed VALVE-IN-HEAD ENGINES provide improved durability and efficiency as well as the world's greatest economy for their size!

Chevrolet trucks have the famous CAB THAT "BREATHES"*! Outside air is drawn in and used air forced out! Heated in cold weather.

Chevrolet Advance-Design brings you the FLEXI-MOUNTED CAB, cushioned on rubber against road shocks, torsion and vibration.

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Uniweld, All-Steel Cab Construction • Large, Durable, Fully-Adjustable Seat • All-Round Visibility with Rear-Corner Windows* • Heavier Springs • Super-Strength Frames • Full-Floating Hypoid Rear Axles in the 3600 Series and Heavier Duty Models • Double-Articulated Brake Shoe Linkage • Hydrovac Power Brakes in Series 5000 and 6000 Models • Multiple Color Options.

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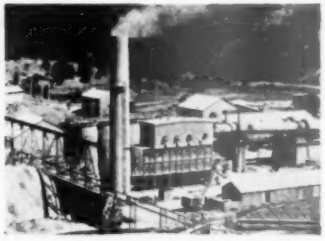
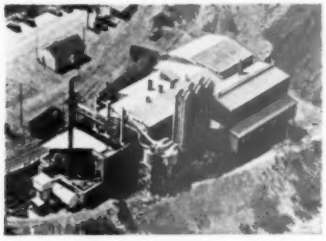
CHEVROLET

Norblo

AUTOMATIC
Bag Type
Dust Collection





. . . for Star Performance at Low Cost

1. Basic unit compartment houses 78 cylindrical cloth bags — fully distended by upward inside air flow.

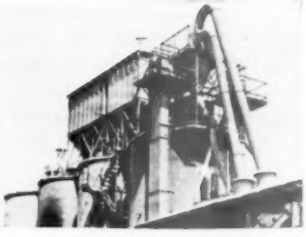
2. Shaking and cleaning involves only one compartment at a time, and only a few seconds out of each hour of operation.

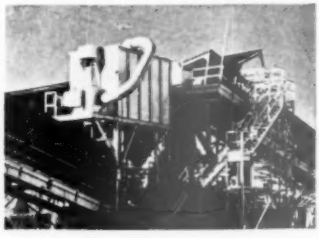
3. Variable timing of cleaning cycle according to dust load insures constant volume of air handled and of dust collected.

4. During shaking period air flow is reversed, loosening dust and accelerating its descent into the hopper.

5. Any compartment may be cut out of operation for repair (from the clean air side) with all other compartments continuing in operation. Adjustment of shaking timer for dust loading can be made in a few minutes without shutting down.

Norblo equipment is completely designed and fabricated in our own shops and sold on the basis of guaranteed performance. If you need dust collection for production, for salvage, for good housekeeping ask Norblo engineers what they can do for you. Let us send you Norblo Bulletin 162-4.





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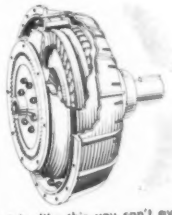
Norblo Centrifugal and Hydraulic Collectors
Cement Air Cooling Systems, Exhaust Fans

"Twice as Tough AS GRANITE!"

TAKES THE "SHOCK" OUT OF ROCK



On tough jobs like this you can't avoid terrific impacts, shocks and high stresses —but on the Lorain-820 these are never transmitted to the machinery or cables. That's because the Hydraulic Coupling swallows up such shocks and strains. Neither can stubborn rock stall the engine.... Ask for more details on this important feature that's standard on all Lorain-820's.

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The Rock?...Yes! The Shovel?...Sure!

• *The John T. Dyer Quarry Co.*, Birdsboro, Pa., report this is one of the toughest jobs in their many quarries. The diabase rock is of igneous formation—as hard as granite and *twice as tough*... No wonder Dyer chose a 2 yd. Lorain-820 for the job.

Lorain-820's have a turntable design that permits concentrating full engine power on any single operation; have a positive chain crowd to deliver this power to the dipper teeth; have an all welded boom that's more rugged than any digging ... and also offer you the many advantages of the "shock-absorbing" hydraulic coupling. These are but a few of the many features you get when you put a Lorain-820 on your job. Get the full story from your nearest Thew-Lorain distributor.

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Union Multiwall Specialist

knows the New Equipment that can cut your packaging costs

MULTIWALL bag packaging can be mechanized to a surprising degree. So if you are using pre-war packaging methods or equipment, your Union Multiwall Specialist can probably give you some money-saving ideas.

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Even if you are now packing your multiwall bags with the most modern equipment, the Union representative who calls on you can give you new ideas to build sales and hold down costs. For he is backed by skilled engineers and packaging experts of America's largest manufacturer of paper bags.

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Let him show you how Union resources and packaging experience can work for you!

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★ ★ ★ Editor's Page

Are Inventories of Spare Parts Adequate?

IT HAS BEEN BROUGHT to our attention that, in several cases recently, cement manufacturers have suffered substantial losses in production because of breakdowns of machinery for which vital replacement parts had not been provided. Some equipment manufacturers believe that the cement industry, like many other industries, is seeking to avoid large inventories of repair parts and supplies in order to benefit from anticipated price reductions.

We doubt that cement manufacturers are holding up so much for price cuts, as possibly from a conviction that they formerly carried too much inventory that was never used. There is, however, always the danger of insufficient reserves being held in stock by an industry that continues to produce short of demand for its product, and which very likely will be called upon to operate at or near capacity for years ahead.

All industries have been cautioned from various sources that they not be caught with inventories at high prices. This is sound advice where the materials must again be sold in the same or other form, but inventory of spare parts to insure keeping a plant operating is quite another thing. Maintenance of adequate spare and repair parts for machinery should be considered not so much inventory as insurance against plant breakdown.

Apparently, these warnings against large inventories, which really do not apply, may have had the effect of cutting supplies of parts on hand for cement machinery. There may be other reasons for the short-sightedness that resulted in embarrassment, and which could well catch up with others in the rock products industries. Certainly, no producer who operates a plant can afford to, or should, risk thousands of dollars in the anticipation of a possible future saving of a few percent in prices of replacement and repair parts.

Expediency Desirable?

During the war years, producers by necessity often had to exercise their own inventiveness and sometimes had to rely on local foundries and repair shops in meeting emergencies so that they could keep their operations going. Experience wasn't always good and, in the long run, it is very doubtful that the practice of having parts made locally, possibly at lower first price, turned out to be cheaper. There are improvements in design, and usage of superior metals, available only from equipment manufacturers who have knowledge of rock products industries and their requirements, which must be given consideration in calculating actual cost, based on operations.

The rock products industries continue to enjoy high volume production, but with one notable exception and that is the foundry sand industry. According to our first-hand knowledge of that segment of the industrial sand industry, volume of sales of molding and core sands has dropped sharply and continues a downtrend.

This trend in sales reflects a great number of fatalities in small foundries of the kind which flourished during the war years and upon which there was some reliance for having parts made locally. Many of them won't be left in business to fabricate emergency parts.

Capacity Operation

As it looks right now, the portland cement industry and, logically, the aggregates industries, will have their plants subjected to a continuation of the kind of punishment they had to endure early in the war and during the past several years.

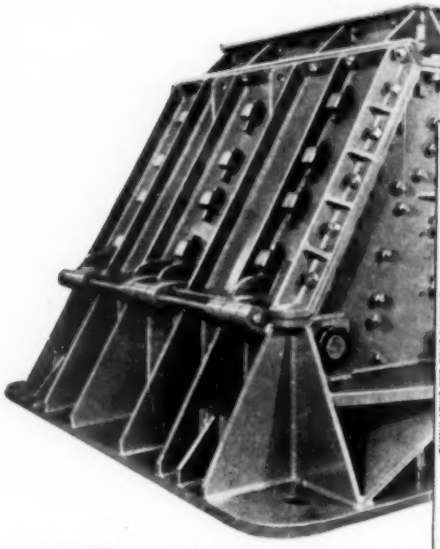
Shipments of cement companies thus far in 1949 are equal to the record-breaking levels of a year ago. A widening of profit margins because of reductions in costs of fuel per unit of output, and higher prices in some areas because of adoption of f.o.b. mill pricing, promises well for the earnings of leading producers. Continuity of production, with minimum down time of plants is, of course, of utmost importance in maintaining favorable operating costs and profit spread.

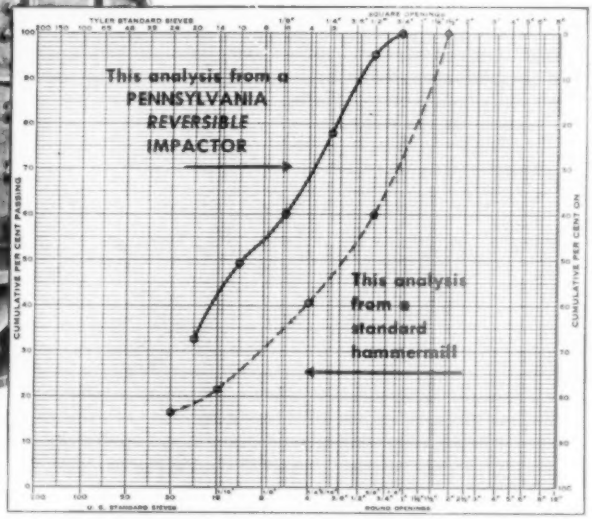
The outlook ahead for construction continues excellent. Already, public spending for construction has at least compensated for reductions in private building during this "recession" and the surface has been barely scratched. The amount of spending planned for river development, highways and all forms of public construction is staggering, and now, with passage of the Housing Act of 1949, we have subsidized housing on the largest scale in history.

It will be the wise thing to take all precautions to guarantee maximum continuity of production of cement and aggregates, for profits, and to serve the public interest. No company should over-stock repair parts but it would be advisable to follow the recommendations on inventory of those who know the equipment best.

Bror Nordberg

Here's PROOF of a *Better Product Lower Costs* for Cement Plants




This analysis from a PENNSYLVANIA REVERSIBLE IMPACTOR
This analysis from a standard hammermill
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CUMULATIVE PER CENT ON

100% top-size product—

Maximum percentage of desirable smaller sizes

Even a small percentage of oversize increases maintenance costs and lowers capacities of grinding mills. The PENNSYLVANIA REVERSIBLE IMPACTOR reduces rock to controlled size. Controlled because the IMPACTOR is "closed circuited." Only desired, top-size particles get through; oversized particles return for further reduction. The delivered particles are predominantly granular because the IMPACTOR does not "crush" its feed but "shatters" it in high-velocity ricochet between rotating strikers, or hammers, and fixed anvils. This *impact-rebound-impact* causes an *explosive* rupture of the rock, producing the granular particles ideal for grinding mills. And the IMPACTOR is reversible: merely by pushing a button you reverse the rotation of the hammers, thus utilizing their back faces and a second set of anvils.

Reversibility means two lives for parts subject to the greatest punishment. "Impact" reduction means elimination of intense friction found in direct crushing methods. Controlled-size, granular product means less work, less depreciation for your grinding mills. In comparison with a standard hammermill, records show the PENNSYLVANIA REVERSIBLE IMPACTOR will save you approximately 50% on parts maintenance, 75% on labor maintenance.

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Rocky's NOTES

Nathan C. Rockwood

"The Proof of the Pudding is in the Eating"

IT APPEARS to be the universal contention of the scientific men in the portland cement manufacturing industry that user demand for fast results with the least effort has driven the industry to the present quality of cement. Moreover, they profess to believe that the quality of present-day American portland cements is the best in the world; and if European constructors obtain satisfactory results with cements of lower quality, or perhaps we should say of different quality, it is because workmen over there are willing to use "elbow grease" and a better standard of workmanship generally, than is practiced in this country. In short, European engineers and constructors still hold to the ancient adage that "haste makes waste."

Specifically, it is contended that our American constructors place concrete in too large quantities at a time, mix it too wet in order to get "workability," cure it too short a time in order to reuse the forms, and in general are driven by an urge for speed on the theory that speed makes for economy. Possibly as the construction industry is now organized, speed does make for economy in first cost, but if any one thing has been demonstrated in our recent concrete practice, it is that speed does not make for overall economy, taking into account the useful life of the structure. Nevertheless, these obnoxious construction practices seem to be so firmly rooted in the United States that cement manufacturers appear to have abandoned hope of changing them, and are inclined rather to seek to make cements that can be used in concrete construction with such abuse as they get.

Test of Good Concrete

In spite of the millions of words written about the properties of cements, aggregates and concrete, with particular reference to causes of failure and disintegration, since the days of that pioneer French researcher, Robert Feret, it has never been disproved that the primary factor to be sought for is a physical property—namely to control the amount and kind of porosity in the set cement, the mortar, the concrete and the aggregates. Without the infiltration, absorption or adsorption of water or moisture, any concrete and any aggregate would be satisfactory and long lasting. As Feret pointed out, there is a difference between porosity and permeability, although they are frequently confused. Porosity he defined as the total space occupied by liquids and gases. Permeability he defined as the amount of liquid or gas which will flow through a given cross-section in a given time under unit pressure differential.

As Feret discovered, and much subsequent research has proved, the smaller and more abundant the pores and capillary channels, the greater the capillary action and the greater the penetration of the moisture and the salt solutions into the interior of the mass. With such a material, whether it be a set, neat cement paste, a mortar, a concrete, or an aggregate, the absorbed or adsorbed moisture and salt solutions are especially destructive, for at least two physical reasons: (1) it tends to retain the moisture and resist drying out; (2) it does not provide space for crystal growth in the case of salt solutions, or for ice crystal expansion with the freezing of moisture. A material with much greater permeability may have pore spaces so large that it is not affected by the same physical phenomena.

Feret said that the chemical nature of the cement is only a secondary factor in the tendency of concrete to disintegrate in contact with a corrosive salt, *in spite of the commonly held hypothesis to the contrary.* So, you see, we are on firm ground when we contend that American engineers have gone too far in attempting to control the quality of concrete by specifying the chemical composition of the cements. If it is true of the cement it is probably equally true of the aggregates. Chert aggregates, for example, have given trouble on occasion not because they contain possibly "reactive silica," or have a high thermal expansion, but because of their physical property of containing a considerable percentage of fine pores and capillary channels. Even a chert of 2.5 specific gravity, which is usually considered "sound," has the difference in specific gravity between quartz at 2.65 and 2.50 to be accounted for only by adsorbed moisture and gases. That difference of 0.15 is 6 percent of the weight of material. This same chert dried out by a hot summer sun, or artificially in a laboratory furnace, makes a satisfactory aggregate, either because the occluded moisture and gases are driven out and the pores opened to adsorb the excess moisture and solutions from the plastic concrete, or because the pores and capillary channels have been shrunk and partly closed.

"Impermeable" Concrete

It follows then that impermeable concrete is not necessarily the answer to a lasting concrete. The porosity may be such as to permit the passage of water and solutions which are redeposited either in the large sized pores or on the surface of the concrete in a way to increase its resistance to disintegration. The kind of concrete to avoid is one in which the pore spaces are of the size and kind and abundance to retain their original moisture rather than to dry out, or to release the salts to more dilute solutions. This kind of porosity in the cement, mortar and concrete is determined chiefly by the amount of mixing water used, the gradation of particle sizes of both cement and aggregates, the length and kind of curing employed, as well as many other lessor factors, such as the method of placing the concrete in the forms.

The best test of the concrete in its plastic state is its workability with a minimum water content. This is attained by proper gradation of particle size from the finest cement particles to the coarsest aggregate sizes. Under present American standards of practice, the worst "gap gradings" are apt to be in the cement itself, for the grading of the aggregates is more easily controlled and more attention is paid to it. The effects of adding pulverized rock dust are often beneficial, even where the particular rock dust has no puzzolanic properties, because it helps, to fill gaps in the grading and this reduces porosity. There may be another physical effect from the use of relatively inert rock dust; it probably disperses the fine cement particles which have a tendency to agglomerate when wet, and if the set occurs in that condition, they form particles with the kind of pore characteristics so detrimental to concrete.

Naturally, we defeat the purpose of adding rock dust if at the same time much additional mixing water is required. In that case it is evident that the dust is not filling gaps in gradings of the concrete ingredients. Some rock dusts, like limestone, however, may be helpful in another physical way, by acting as sponges to absorb or adsorb the excess water along with the dissolved salts in it, and thus serve to make a tighter, less porous concrete.

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"Run away" Dangers eliminated — independent propel keeps crawler geared to propel power at all times.

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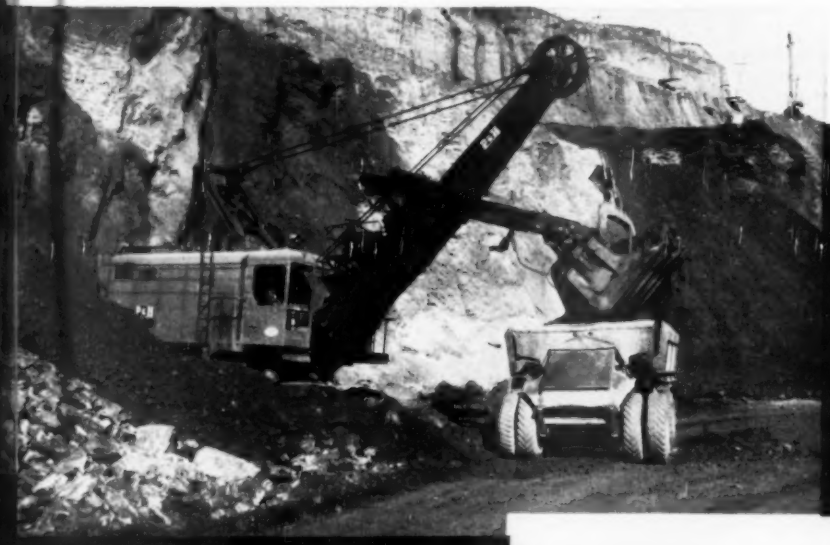
These and other important Added Values explain why users along the Iron Range are reordering P&H Electric Shovels.



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LABOR RELATIONS TRENDS

Right-to-Work is Still a National Issue

By NATHAN C. ROCKWOOD

THE PASSAGE of the Taft amendments to the Thomas labor bill in the Senate of the United States has saved, at least, temporarily, some of the chief features of the present Taft-Hartley Act. At this writing (July 12) there appears to be some doubt that the House of Representatives will take any action on the Senate bill at this session, or if it should act, whether or not the President would veto. The Administration appears to consider it to be "good politics" to leave the issue unsettled until the 1950 congressional elections.

In the bill as amended in the Senate under the leadership of Senator Taft of Ohio, the present law would lose two provisions that many employers consider to be generally sound and reasonable. One is the requirement for a National Labor Relations Board election before a union may enter into a union-shop contract; the other is removal of the present ban on "featherbedding." The latter provision apparently has been ineffective because such matters are usually taken care of in union contracts, and employers have not found it profitable to resist union demands on such issues; at least, few if any important cases seem to have arisen.

The Taft Amendments

The amendments proposed by Senator Taft to the Thomas bill are so extensive that they are now referred to as the "Taft bill," the final vote for which was 51 to 42. The Senator analyzed the effects of his amendments on the present Taft-Hartley Act for the *Congressional Record* about as follows: "(1) Unions as well as employers will be forbidden to engage in unfair labor practices and be subject to the procedures of the N.L.R.B. to prevent such practices. While we have removed the so-called mandatory injunction provisions, we retain the Board's right to seek temporary injunctions against unfair labor practices by both employers and employes.

"(2) Unions as well as employers are required to bargain collectively.

"(3) Unions as well as employers remain responsible on their contracts, and are liable to suit in the federal courts as if they were corporations. They are also liable for damages caused by secondary boycotts and jurisdictional strikes.

"(4) The unfair labor practice of secondary boycott and jurisdictional strike is continued, although one type of secondary boycott is permitted against work transferred from a struck plant.

"(5) It remains an unfair labor practice for a union or an employer to coerce employes in such a way as to interfere with their right to organize or their right to work. This prohibits mass picketing.

"(6) The guaranty of the right of free speech has been retained with a slight modification.

"(7) The closed-shop prohibition is retained, although we permit employers to give the union a reasonable time in which to submit names to fill employment vacancies. The authorization of union-shop contracts is continued without requiring any vote. Unions may require the discharge of union members only for non-payment of dues, engaging in wildcat strikes in breach of contract, or communist membership.

"(8) The power of the States to regulate compulsory unionism within their boundaries is preserved.

"(9) Unions are held responsible for the acts of their agents as if they were corporations, but not for the acts of individual members as such.

"(10) We have discontinued the exclusion of foremen from coverage.

"(11) Labor organizations as well as corporations are prohibited from making contributions to political candidates, but the word expenditures is removed from the present Act. We feel that expenditures of any importance are in fact contributions.

"(12) The prohibition of strikes by government employes is continued.

"(13) The independent mediation service is continued and not placed in the Department of Labor.

"(14) While extensive changes are made in the procedure dealing with national paralysis strikes, the power of the President to secure an injunction for 60 days is retained.

"(15) The non-communist affidavit requirement has been retained and extended to employers.

"(16) The requirement that unions make a financial report to the Secretary of Labor and to their members is retained.

"(17) The requirement for a 60-day's notice of proposed termination or modification of collective-bargaining contracts, so that strikes may not be called without notice to the employer and the mediation service, is retained.

"(18) The ban on check-off of employes' dues without their written consent remains in the Act, though modified to make it unnecessary to obtain new consents every year.

"(19) The N.L.R.B.'s right to prevent excessive discriminatory initiation fees in union-shop situations is continued.

"(20) The protection of welfare funds is continued, but placed under the direct supervision of the Secretary of Labor.

"(21) While we do not retain the independent counsel of the N.L.R.B., we have retained many of the procedural reforms made in the Taft-Hartley Act, including: (a) an enlarged Board operating in panels to expedite handling; (b) the abolition of the review section; (c) the emphasis on proper rules of evidence; (d) the greater power of review by the courts; (e) reforms in election procedures permitting employer petitions for decertification, the limiting of elections to one per year and the permitting of a vote for 'no union' in a run-off election.

"(22) We have retained the requirements that equal treatment be accorded to independent unions, that professional employes be given an opportunity to separate representation, that greater consideration be given craft employes, and we have also continued the abolition of the 'extent-of-organization' theory."

The various terms used in the Act such as "employer," "supervisor," "agency," etc. have been redefined or clarified. The National Labor Relations Board membership would be increased from five to seven, and made bipartisan. The changes in the injunction clauses of the Taft-Hartley Act, which the labor union leaders most seriously objected to, include repeal of the section making it mandatory for the Board to seek temporary injunctions in certain cases and giving priority to such action. However, the Board would retain power to seek temporary injunctions if it chose to do so.

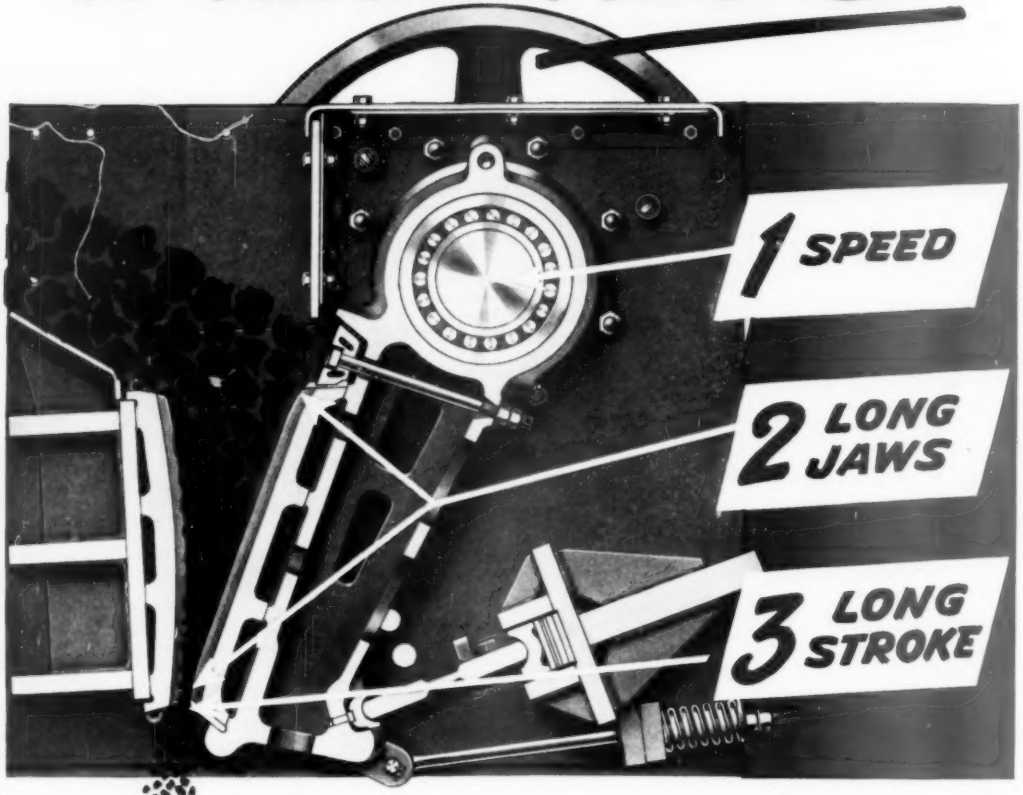
To meet national emergency strikes, the new Taft amendments modify existing provisions of the law in several respects. The president may call on employer and employes alike to continue work before appointing a special Board of Inquiry. Such a board may make definite recommendations. If the strike or lockout occurs notwithstanding, the President may either submit the whole matter to Congress for special legislation, or he may apply to a court to authorize an injunction for 60 days, or he may order seizure of the plant, or both.

U. S. Supreme Court to Review Arkansas Law

The United States Supreme Court consented on June 13 to review a decision of the Arkansas Supreme Court upholding the constitutionality of the state's right-to-work statute. The Arkansas Supreme Court made its first decision in the case of *Cole et al v. State of Arkansas* on October 25, 1948. It involved violation of Section 2 of a statute passed in 1943, making it unlawful for any person acting in concert with other persons to assemble at any place where a labor dispute exists, and by force or violence prevent any person from engaging in any lawful vocation. The court held the law a constitutional exercise of State's

(Continued on page 191)

It Takes ALL 3



to put the maximum amount of rock through a jaw crusher

No other crusher *excels* the A-W in *any one of the three.*

No other crusher *equals* the A-W in *all three.*

That's why no other crusher turns out as much rock.

AUSTIN-WESTERN COMPANY • AURORA, ILLINOIS, U. S. A.

Austin Western

the *Personal Side* of the news

Research Director Resigns

DR. LINCOLN T. WORK has resigned as director of research and development of Metal & Thermit Corp., New York, N. Y., to become associated with

Dr. Lincoln T. Work

Alan R. Lukens at Powdered Material Research Laboratories, Cambridge, Mass. Dr. Work is an authority on grinding, classification and filtration. Prior to joining the Metal & Thermit Corp., Dr. Work was on the staff of the Chemical Engineering Department at Columbia University. In 1945 he was chairman of the A.S.T.M. Technical Committee III on particle size, also the A.C.S. symposia on grinding and fine particles at Brooklyn Polytechnic Institute, and on fluidization at Massachusetts Institute of Technology in 1948.

N.R.M.C.A. Fellowship

W. G. MULLEN of Richmond, Va., an honor graduate in Civil Engineering from Virginia Military Institute, has been appointed to the Stephen Stepanian Fellowship sponsored by the National Ready Mixed Concrete Association, Washington, D. C. Mr. Mullen, who will be at the University for two years, will do research in the concrete field under supervision of the association, and will also take academic work, leading to the degree of Master of Science.

Operating Manager

JAMES A. GISH, JR., has been appointed operating manager at the Harleyville, S. C., plant of Carolina Giant Cement Co., Philadelphia, Penn. C. J. KNICKERBOCKER, who was formerly chief chemist at the Fredonia, Kan., plant of Consolidated Cement Corp., Chicago, Ill., has been named chief chemist and assistant superintendent. BAYNE GARNER has been made assistant chief chemist.

Anniversary Speakers

C. A. WILLSON, research engineer, American Iron and Steel Institute Committee on Reinforced Concrete Research, was one of the principal speakers at the 25th Anniversary Meeting of the Concrete Reinforcing Steel Institute at The Greenbrier, White Sulphur Springs, W. Va. A Certificate of Award and $500 prize money were presented to the firm of Ammann & Whitney, consulting engineers of New York, N. Y., and Milwaukee, Wis., for their paper entitled "Thin Shell Concrete Structures." Other speakers were Herbert E. Calves, president of the Institute, and vice-president of Taylor-Davis, Inc., Philadelphia; David F. Austin, vice-president of U. S. Steel Corp.; and C. M. Hathaway, chief engineer of the Illinois Division of Highways.

Assists Managing Director

WILLIAM A. HALEY III has joined the staff of the American Concrete Pipe Association, Chicago, Ill., as assistant to Howard F. Peckworth, managing direcor. Mr. Haley attended Hampden-Sydney College and Virginia Military Institute. His studies were interrupted by three years of active duty as a combat First Lieutenant of Artillery attached to the 665th Field Artillery Battalion of the Third Army in the European theater of the war. He returned to his studies after the war, and received his B. S. degree in civil engineering in February, 1947.

William A. Haley, III

Heads Engineers Club

A. G. COCHRAN, Ohio sales manager of the Universal Concrete Pipe Co., Columbus, Ohio, has been elected president of the Engineers Club of Colum-

A. G. Cochran

bus. He succeeds N. O. Wagner, district manager of the Portland Cement Association, Columbus, Ohio. Other officers are C. G. Walker of Jennings-Lawrence Co., vice-president; Phil Rhea of the Ohio State Highway Department, secretary-treasurer. Max Ross, C. K. Bradley, Floyd Redick and G. J. Thormyer are directors.

Goes to Europe

WILLIAM J. REARDON, president of Reardon Industries, Inc., Cincinnati, Ohio, manufacturers of colors for terrazzo and concrete, is visiting Italy, France, Ireland, England, Portugal and Switzerland for the purpose of studying the construction of concrete floors in monumental buildings in these countries. He is of the opinion that the outlook for the concrete floor industry is for more improvements and better materials, and that a study of the older methods would be timely. Mr. Reardon is a member of the board of trustees of the Ohio Turnpike Committee. He is also a member of the American Concrete Institute, American Chemical Society and the Cincinnati Engineering Society.

Traffic Manager

JOHN DOANE, who has been assistant traffic manager of Calaveras Cement Co., San Francisco, Calif., since January, 1948, has been appointed traffic manager.

Tours Marquette Plants

W. A. WECKER, president of Marquette Cement Manufacturing Co., Chicago, Ill., recently made a tour of the company's plants in Cape Girardeau, Mo., Nashville, Tenn., Cowan, Tenn., Oglesby, Ill., and Des Moines, Iowa, presiding at a series of management conferences with supervisory personnel at the various plants. This tour concluded the second year of these monthly meetings for discussions of company policy and problems. Mr. Wecker was accompanied by W. E. ERWIN, manager of industrial relations, and JACK K. WHITE, director of public relations. It is planned to continue these monthly meetings in the Fall.

Starts Concrete Plant

W. E. PUGSLEY has resigned as secretary of the Fleming Manufacturing Co., Inc., and the Concrete Transport Mixer Co., Inc., both of St. Louis, Mo., and will go into partnership with Harry Maclay in a new concrete products plant at Herculaneum, Mo. A sales office will be maintained at Festus, Mo., where Mr. Maclay now operates a concrete block plant

Sales Representative

PAUL BEINHORN, vice-president of the Trap Rock Co., Minneapolis, Minn., has joined the J. L. Shiely Co., St. Paul, Minn., as sales representative for the State of Minnesota. Prior to his association with the Trap Rock Co., Mr. Beinhorn served with the Portland Cement Association for eight years.

U. S. Visitors

ALEX. BEKIARIS AND THEOD. BIZAKIS, of the General Cement Co., Santarosa Street No. 3, Athens, Greece, were recent visitors of ROCK PRODUCTS. They are visiting the United States and Canada to study the most recent developments in the portland cement industry.

Heads Association

CLIFFORD F. FAVROT, president of Asbestone Corp., New Orleans, La., has been elected president of the Asbestos Cement Products Association. William R. Wilkinson of Johns-Manville Corp., was named vice-president; S. P. Moffit, Ruberoid Co., treasurer; and Chester C. Kelsey, secretary.

Executive Secretary

C. A. SIRRINE, a member of the architectural firm of Loree & Sirrine, Ann Arbor, Mich., has been appointed executive secretary of the Detroit Concrete Products Association. Mr. Sirrine, who inaugurated the concrete house plan service widely used by concrete block manufacturers and home builders, will devote his entire time to the promotion of concrete masonry in the Detroit area.

S.E.G. President-Elect

DR. MORRIS M. LEIGHTON, chief of the State Geological Survey, Urbana, Ill., has been made president-elect of the Society of Economic Geologists for the year 1950-51. Previous to coming to the Survey, Dr. Leighton taught geology for seven years at the Universities of Washington, Ohio State, and Illinois. He received his Ph.D. degree at the University of Chicago in 1916.

Assists Plant Manager

PAUL E. PATTON has been appointed assistant plant manager at the Hudson, N. Y., plant of Universal Atlas Cement Co., New York, N. Y. Mr. Patton started with the company in 1926 as a stenographer. He was made assistant to the plant manager in 1942.

Publicity Chairman

RONALD E. DANIELS, vice-president and secretary of the Federal Portland Cement Co., Buffalo, N. Y., has been named chairman of publicity for the Eastern Spring Conference of the Controllers Institute of America to be held in Buffalo, N. Y., in April, 1950.

District Engineer

WALTER F. WINTERS, formerly district engineer for the Washington State Highway Department, Seattle, Wash., has been appointed district engineer for The Asphalt Institute, with headquarters in Denver, Colo.

Awarded Plaque

ERNEST E. SWARTSWELTER, a director of the Bessemer Limestone and Cement Co., Youngstown, Ohio, was presented with a plaque at a recent Chamber of Commerce dinner in Ellwood City, Penn.

On Board of Directors

HOWARD W. JORDAN, chairman of the board of the Metropolitan Sand and Gravel Corp., Port Washington, N. Y., has been elected a director of The National Supply Co., Pittsburgh, Penn.

Named Superintendent

P. W. GIFFORD, JR., has been appointed superintendent of the slag crusher of Gifford-Hill and Co., Dainerfield, Texas. He was formerly general mine foreman for the Lone Star Steel Co.

Expert on Concrete

FRANKLIN R. MCMILLAN, retired director of research for the Portland Cement Association, Chicago, Ill., recently gave an illustrated lecture on "New Developments in Concrete," at a meeting of the Toledo Chapter of the American Society of Civil Engineers. Mr. McMillan is a past-president of the American Concrete Institute and was awarded the Wason Medal some years ago for his book "Concrete" which he wrote for the Institute in 1928.

Head of Mica Firm Interviewed

DAVID T. VANCE, owner and manager of the Tar Heel Mica Co., Plumtree, N. C., was recently interviewed by *Business Week* on the effect in small rural plants of the government's proposal to raise legal minimum wages to 60c or 75c. Mr. Vance believes that this increase would cripple small industries, that the big plants have the advantage of huge volumes of business over which to spread their overhead. He has noticed that big manufacturers are gradually moving out of highly industrialized centers.

Reelected Chairman

GEORGE T. DOBBIE has been reelected chairman of the board and president of Gypsum, Lime and Alabastine, Canada, Ltd. Other officers elected are: J. E. McConnell, vice-president; C. Gordon Cockshutt, vice-president; and P. P. Tyler, vice-president and managing director. Directors include S. G. Dixon of Montreal, Robert A. Bryce of Toronto, and W. H. Cooper of Hamilton.

Appointed Secretary

F. W. KUHL, secretary-treasurer of The Kelley Island Lime and Transport Co., Cleveland, Ohio, has relinquished a part of his duties with the company. WILLIS T. BELL, assistant secretary and assistant treasurer, will assume Mr. Kuhl's responsibilities as secretary and continue as assistant treasurer. RALPH L. DICKEY has been reelected president and A. B. MACK, executive vice-president.

Discusses Concrete

JOHN R. SNOWBALL, structural engineer in the Columbus, Ohio, office of the Portland Cement Association, Chicago, Ill., recently gave a talk in Columbus at an instruction school on cement, sponsored by the General Contractors Association. The subject of Mr. Snowball's talk was the recent developments in the design and handling of concrete.

Tells Uses of Gypsum

FRANK KASTOR of the Port Clinton, Ohio, plant of United States Gypsum Co., Chicago, Ill., recently gave a talk before the Kiwanis Club of Port Clinton on the uses of gypsum as molding material for mannikins, imitation alabaster figurines, plaster casts, wallboards, etc. A movie, entitled "White Magic," and made in Hollywood with leading film stars, was shown by Mr. Kastor in connection with his talk.

Alpha Promotions

R. L. MITCHELL, district sales manager in the St. Louis, Mo., office of the Alpha Portland Cement Co., Easton, Penn., has been promoted to the position of assistant general sales manager, with headquarters at Easton, Penn.

CARL H. SCHLUTOW, who has been Mr. Mitchell's assistant in St. Louis, will succeed him as district sales manager.

President Resigns

H. F. GARVIN PELSUE has resigned as president of the Metropolitan Sand and Gravel Corp., New York, N. Y. Howard W. Jordan, chairman of the board, will succeed him as president. Howard Marsh has been elected vice-president in charge of operations, and E. J. Head has been named vice-president in charge of sales.

Elected President

JOSEPH M. SCHEININ, secretary-treasurer of James A. Norton, Inc., New York, N. Y., has been elected president of the company to succeed the late James A. Norton who passed away May 24. JOHN A. NORTON has been named vice-president. Mr. Scheinin has been associated with the firm since 1926.

Elected Board Members

FRANCIS B. CUMMINGS, secretary and controller, and Roy S. Adkins, vice-president in charge of sales, North American Cement Corp., New York, N. Y., have been elected members of the board of directors.

Division Chairman

FRED WITMER, president of The Ohio Hydrate and Supply Co., Woodville, Ohio, has been appointed chairman of the Operating Division of the National Lime Association, Washington, D. C.

Masonry Industry Speaker

E. W. DIENHART, executive secretary of the National Concrete Association, Chicago, Ill., recently gave a talk on the "Concrete Masonry Industry" at a meeting of concrete block distributors of the Clinton Construction Co., ready-mixed concrete and concrete block firm of Wilmington, Ohio. A visit to the plant in the afternoon was followed by a dinner and a sound movie on "Building with Concrete Masonry."

Lectures on Concrete

HARLAND G. WOOD, Columbus, Ohio, highway engineer for the Portland Cement Association, Chicago, Ill., gave an illustrated lecture on the development and uses of air-entrained concrete, at a recent meeting of the Mahoning Valley Chapter of Professional Engineers.

C.M.M.A. Vice-President

C. W. TINKER, San Joaquin Block-lite Co., Selma, Calif., has been appointed vice-president of the Concrete Masonry Manufacturers Association, Los Angeles, Calif., to serve the unexpired term of William A. Grindle of the same company.

Association President

WALTER H. ACHESON, manager of Somers-Barr, Inc., Champaign, Ill., has been elected president of the Wabash Valley Ready Mixed Concrete Association, Indianapolis, Ind.

OBITUARIES

FRANK H. POWELL, president, Southwestern Portland Cement Co., Los Angeles, Calif., died of a cerebral hemorrhage July 6 at Good Samaritan Hospital in Los Angeles, where Mrs. Powell is recovering from an operation. He was 65 years old. Mr. Powell started his business career with Fairbanks, Morse and Co. He became associated with the Southwestern Portland Cement Co. in 1907, succeeding to the presidency upon the death of his father-in-law, Carl Leonardt, in 1927. Mr. Powell, who was prominently known in the cement industry, was also a director of the Blue Diamond Corp., Los Angeles, and the Grand Canyon Lime and Cement Co. of Arizona.

Frank H. Powell

RUSSELL GLOVER HAY, vice-president of The Ayers Mineral Co., Zanesville, Ohio, died June 12 in Ocala, Fla. He was 59 years old. Mr. Hay had been in ill health for the last three years and had spent the winter at Clearwater, Fla. He was leaving by train for Zanesville when he was stricken near Ocala and taken to a hospital. Mr. Hay joined the Ayers Mineral Co. in 1922 and served as a salesman until 1942 when he was appointed president upon the death of E. M. Ayers, founder of the company. In 1947 he became vice-president, serving in an advisory capacity. Mr. Hay was prominent in the industrial sand industry. He was one of the founders of the National Industrial Sand Association, Washington, D. C., and served as president for two years. He was also a member of the American Foundrymen's Association, the American Ceramic Society, and the U. S. Potters Association.

EDWARD W. LADD, former president of the Albany Builders Supply Co., Albany, N. Y., died June 23 of injuries received in an automobile-truck accident. Mr. Ladd was driving at the time. He was 73 years old.

FRANKLIN CARTER CHENEY, president of the Cheney Lime and Cement Co., Birmingham, Ala., died June 1 at his home in Allgood, Ala., following a long illness. He was 69 years of age and had been in ill health for the past five years. Mr. Cheney, who founded the business about 46 years ago, was a former president of the Southeastern Lime Association.

HORACE WADE RAULSTON, who had been employed for 38 years at the Richard City, Tenn., plant of the Pennsylvania-Dixie Cement Corp., New York, N. Y., died June 4 at the age of 78. Mr. Raulston had retired about three years ago and moved to Chattanooga, Tenn.

JAMES EDWARD POTTER, superintendent of the Tennessee Valley Sand and Gravel Co., Sheffield, Ala., passed away June 11. He was 64 years old.

PERCE CLEMENT, an associate of George W. Katterjohn, president of Katterjohn Concrete Products, Paducah, Ky., passed away June 3 in Paducah.

CHARLES E. FONTAINE, vice-president of the Birmingham, Ala., division of Lone Star Cement Corp., New York, N. Y., died suddenly at his home in Mountain Brook, Ala. He was 52 years old.

WILLIAM C. MATTISON, secretary and director of the Woodstock Slag Corp., Birmingham, Ala., died April 2.

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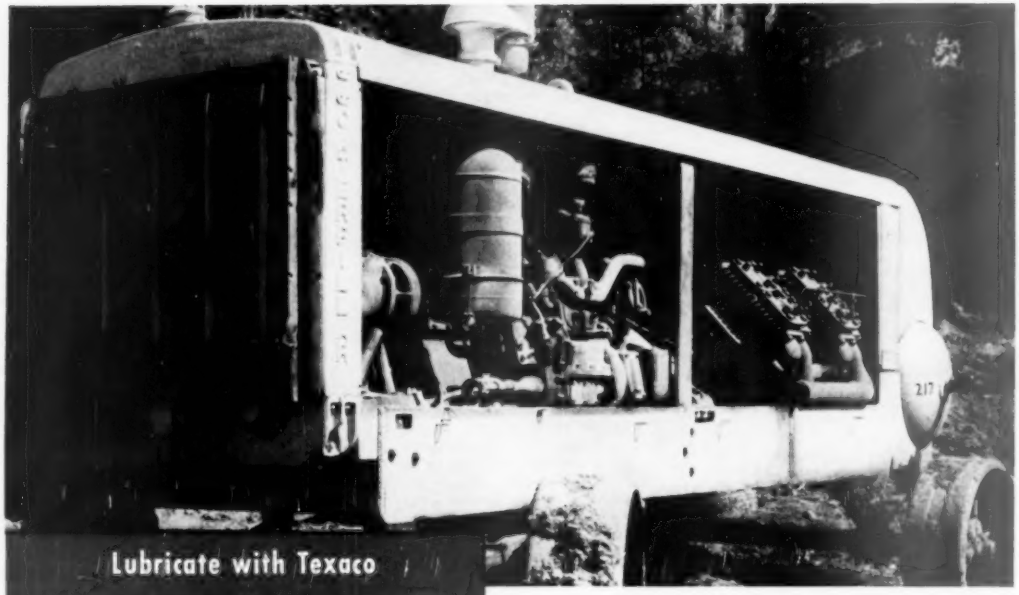

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INDUSTRY News

Large Asbestos Development

JOHNS-MANVILLE CORP., New York, N. Y., announced recently that $10,000,000 had been earmarked for development of the company's new asbestos mine and plant near Larder Lake, Ontario, Canada. Lewis H. Brown, chairman of the corporation, stated that the fibre is among the best quality of ore on the North American continent.

It is planned to have the new plant in operation by the end of 1949 and construction of a second mill will be commenced immediately after completion of the first. The new deposit is reported to be very extensive.

Changes Ownership

DOMINION LIME LTD., Lime Ridge, Quebec, Canada, manufacturer of Adhesive lime, Rock City lime, Bulldog hydrated lime and Spredmor crushed limestone, has changed ownership with the new officers being as follows: president, F. R. Graham, Jr.; vice-president, Tom Dunbar; secretary-treasurer, C. N. Knowles, and managing-director, J. Alex Stewart. The company for some years past was a totally-owned subsidiary of the Brompton Pulp & Paper Co., Ltd. The lime burning plant is being completely modernized for increased capacity with the work being supervised by the Azbe Corp., St. Louis, Mo.

Completes Expansion Program

ALBUQUERQUE GRAVEL PRODUCTS CO., Albuquerque, N. M., is completing its $400,000 expansion program, according to Gene Sundt, vice-president of the firm. The project includes a new shop, a new sand and gravel plant with a capacity of 200 cu. yd. per hr., and a new batching plant. The latter, when in full production, will boost the firm's present output of ready-mixed concrete from about 500 cu. yd. per day to 1200-1500 cu. yd. per day.

Cement Plant Expansion

SOUTH DAKOTA STATE CEMENT PLANT, Rapid City, S. D., has started an expansion program which, when completed, will more than double the present daily capacity of 2000 bbl. Improvements to be made include installation of a third kiln, 375 ft. long by 11 ft. dia., and construction of storage, packing and loading facilities including 10 concrete silos. Frank Gardner is plant superintendent.

Manganese from Slag

GEORGE R. SYLVESTER, president of Sylvester & Co., Cleveland, Ohio, has developed a process which, if economically feasible, will result in millions of dollars' worth of manganese being reclaimed from slag now cluttering steel producing centers. This type of slag runs between 6 and 7 percent manganese, according to Mr. Sylvester. Last year when more than 66,000,000 tons of finished steel were produced, some 6,600,000 tons of slag resulted, containing over 400,000 tons of discarded manganese, perhaps two-thirds of the country's annual needs. Mr. Sylvester described his process of reclaiming, or beneficiating, manganese as being similar to the manufacture of portland cement. The slag is crushed and ground into a manganese fraction and an agricultural stone fraction. Flotation is then employed, with much the same mineral dressing technique as is used in refining gold, silver or copper ore.

Phosphate Plant Closes

THE FERNANDINA PHOSPHATE CORP., which has been operating a phosphate plant at Fernandina, Fla., since 1919, has announced plans to discontinue operations. A processing plant used to dry and crush rock for loading on ships has been shut down several months, and vessels have called periodically since then to load the last of the rock.

Limestone Plant Sold

ROBERT C. HONEA AND JAMES FISHER, Idabel, Okla., have sold their interests in the McCurtain Limestone Co. to James G. Brown, Robert G. Brown and L. E. Brown of Chicago, Ill. The quarry, located just outside of Idabel, will be equipped to produce rip-rap and agricultural limestone with a minimum capacity of 400 t.p.d.

Buys Granite Company

PALMER WAMSTAD has purchased interests in the Hatton Granite Co., Hatton, N. D., becoming co-owner of the firm along with C. L. Ness who will continue to head the organization.

State Conducts Survey of Rock Products

THE VIRGINIA DEPARTMENT OF HIGHWAYS has undertaken a state-wide survey of stone, sand and gravel deposits to provide information that should help reduce roadbuilding costs. Samples of material are sent to the department's testing laboratory for classification according to department specifications, after which the location of each deposit is put on a master map for the information of highway engineers and contractors. Known deposits are being recorded first, after which all sites where there are surface indications of unexploited deposits will be examined.

New Fertilizer Plant

SIMPLOT FERTILIZER CO., Pocatello, Idaho, has started production of ammonium phosphate at its Salt Lake City plant, J. R. Simplot, president, has announced, with phosphate mined at the firm's Fort Hall, Idaho, location being shipped to Salt Lake City for processing. In addition, sulfate of ammonia, a nitrogen fertilizer, is being produced. Scarce chemicals needed in operation of the plant have been obtained and 24 carloads of anhydrous ammonia have been delivered. This material had been unavailable in the past forcing the plant to remain idle.

Rich Marble Deposit

JOSEPH AND DAVID COWAN, who have been testing their marble deposit near Canon City, Colo., have discovered that it contains a high-quality stone of distinctive coloration. The marble ledges are estimated to be 250 ft. thick, approximately a mile in length and half a mile deep. The marble has seven shades, ranging from olive green to light yellow and from light to dark orchid, and there are some red-veined pink colors, shading to salmon.

Opens Quarry

KASER CONSTRUCTION CO., West Des Moines, Iowa, is starting quarry operations near Red Oak to produce agricultural limestone and stone for road work. A portable crushing plant will be moved to the site from Selma, Iowa. The Kaser firm currently operates three quarries and a gravel plant.

Speed Dam Construction with "Cement Lift"

CALAVERAS CEMENT CO., San Francisco, Calif., in an effort to speed construction of the Pacific Gas & Electric Co. hydro-electric plant on Feather River in the northern part of the state, has placed in operation what it calls a truck-borne "cement lift," company officials have revealed. At crucial periods in the construction such as the pouring of Cresta and Rock Creek dams, heavy truck and trailer combinations carried cement from the San Andreas plant up Feather River Highway to the project site and back on a day-in, day-out, around-the-clock schedule.

For several weeks at a time, as occasion required, the trucks would carry out their 24-hr. a day schedule without let-up. They were dispatched for the 425-mi. round trip, most of which was through mountainous country, at average intervals of 50 min. Cement deliveries thus far have involved over 1,000,000 mi. of truck travel. In many instances special roads had to be constructed to enable the trucks to carry their loads off the main highways to the various construction sites. The "cement lift" operation utilizes bottom-dump tractor and trailer combinations designed for the purpose.

Cement company officials estimate that over one-half million bbl. of cement will have been poured into the dams, tunnels and power stations of the project by the time it is completed this fall—a total equivalent to 100,000 tons. Five batching plants are maintained by contractors on the project site where the bulk cement is mixed and dispatched for pouring.

Phosphate Lease Bids

THE WESTERN PHOSPHATE ASSOCIATION OF SALT LAKE CITY, UTAH, a farmer-cooperative organization, has offered the government a cash bonus of $20.67 per acre for a phosphate lease on 1,483.55 acres of public land in Caribou County, Idaho, or a total of $30,665. Simplot Fertilizer Co., Pocatello, Idaho, offered $6,271.08 for an additional tract of 866.03 acres. The government has opened these public lands to foster exploration and production of western phosphate deposits as a fertilizer source for western farm land.

Portland Cement Production

PRODUCTION of portland cement in May, 1949, totaled 18,622,000 bbl., an increase of 5 percent over the May, 1948, output, Bureau of Mines reports. Mill shipments totaled 19,426,000 bbl., a decrease of 1 percent compared with the May, 1948, output, while stocks of 22,173,000 bbl. on May 31 were 38 percent above the May, 1948, totals. Clinker output in May, 1949, amounted to 18,620,000 bbl., an increase of 6 percent over the corresponding month of the previous year.

Our Cover

OUR SELECTION for a cover illustration for this annual cement issue of ROCK PRODUCTS is the Huron Portland Cement Co. plant, Alpena, Mich. We believe our selection is appropriate because this plant is probably the largest single mill in operation today (there may be some dispute). This statement is based on the mill's ability to grind clinker into cement every day throughout the year.

Another factor in our selection of a cover picture is Huron's outstanding contribution to the science of material handling in the development and perfection of low-pressure, air-activated gravity conveyors which are proven in plant operation. "Airslides," as they are appropriately named, are the subject of an article in this issue covering the plant at Alpena.

The cover is an exact reproduction of an aerial Kodachrome taken especially for the purpose.

Reduced Freight Rates on Crushed Stone

THE PUBLIC SERVICE COMMISSION, Binghamton, N. Y., recently conducted a hearing on an application by the D.L. & W. railroad to reduce the freight rate on crushed stone shipped from Jamesville and Rock Cut near Syracuse. An attorney for N. R. Corbisello, who earlier in the year opened a stone quarry on Ingram Hill, opposed the application on the grounds that if lower freight rates were placed in effect "they would stifle competition."

The railroad contended that it was necessary to reduce freight rates on crushed stone in order to meet competition from truckers; and a witness for the railroad said that the railroad would make money on crushed stone hauled to Binghamton from the Syracuse area. The railroad is seeking to reduce rates from $1.45 per ton to $1.15 on crushed stone delivered in Binghamton. The rates are subject to a 6 percent temporary increase granted last January.

Coming Conventions

Week of September 25, 1949—

American Institute of Mining and Metallurgical Engineers, Mid-Year Meeting, Ohio State University, Columbus, Ohio.

October 10-14, 1949—

American Society for Testing Materials, 1st National West Coast Meeting, Fairmont Hotel, San Francisco, Calif.

October 24-28, 1949—

37th National Safety Congress and Exposition, Chicago, Ill.

November 29-30, 1949—

National Slag Association, Annual Meeting, Netherland-Plaza Hotel, Cincinnati, Ohio.

January 17-19, 1950—

National Agricultural Limestone Association, Fifth Annual Convention, Hotel Statler, Washington, D. C.

Week of January 22, 1950—

National Sand and Gravel Association, 34th Annual Convention and Exhibit, Stevens Hotel, Chicago, Ill.

Week of January 22, 1950—

National Ready Mixed Concrete Association, 20th Annual Convention and Exhibit, Stevens Hotel, Chicago, Ill.

Week of January 29, 1950—

National Crushed Stone Association, 33rd Annual Convention and Exhibit, Stevens Hotel, Chicago, Ill.

January 31—February 2, 1950—

Agricultural Limestone Institute, 5th Annual Convention, Stevens Hotel, Chicago, Ill.

Pennsylvania Ag-Stone Group Directors Meeting

AGRICULTURAL LIMESTONE DIVISION, Pennsylvania Stone Producers Association, Harrisburg, Penn., held an informal directors meeting recently. Chairman F. Edward George called on John Smith, Production & Marketing Administration, to briefly outline progress made in agricultural limestone use in the first half of 1949. Mr. Smith, in closing his remarks, suggested that if newspaper advertising were to be done, it be started early in the year, possibly January; and that half-pages would be more effective than smaller spaces, even if fewer in number.

Philip E. Heim, Carbon Limestone Co., Youngstown, Ohio, raised the subject of the method of taking samples from a load of agricultural limestone. His suggestion was to use a tool that would probe for the sample, and by using the same tool throughout the state, the method would be standardized. The 1950 P.M.A. program was discussed, at which time the group was told that a $5,500,000 program was expected (as opposed to $3,800,000 in 1949); with the Government contributing 60 percent and the farmer 40 percent, which is the same proportion as the 1949 program.

It was deemed advisable to hold an open meeting for all producers of agstone.

In closing, the group voiced its objections very forcefully to the use of seasonal bids. Members and guests in attendance were: Ed George, H. W. Lamb, K. O. Brown, P. E. Heim, Bob Garman, Carl Beckler, H. W. Lynn, John Smith, Tony DiSanto, Leonard Fry, Paul Detwiler and H. H. Wagner.

N.A.L.A. Meeting

NATIONAL AGRICULTURAL LIMESTONE ASSOCIATION held its mid-summer convention and board meeting June 14-15, at the Hotel President, Kansas City, Mo. Vice-president Jack Deely, assisted by Ray Clark, Bob Patton and Barney Scharbach, discussed "The Development of N.A.L.A.—Its Purposes and Methods of Operation." During the afternoon session of the first day, Art Alvis, secretary-treasurer of the Missouri Limestone Producers Association, gave a talk on the importance of more and better promotional work on the part of the entire industry. The evening session was presided over by N.A.L.A. president, H. C. Gray. Arnold W. Klemme, University of Missouri, and Congressman George H. Christopher spoke. The latter discussed his experiences of building up worn-out Missouri farmland with conservation practices.

At the directors' meeting, the program for the association's fifth annual convention, to be held at the Hotel Statler, Washington, D. C., January 17-19, 1950, was drawn up with the following provisions: the first day will be devoted to a board meeting, with general sessions taking place the next two days; a general discussion to be led by a panel of experts in various operations involved in the industry will be an added feature; and the annual banquet and reception will be held on the last evening instead of the first.

Civil Engineers Hold Meeting in Mexico

THE COLLEGE OF CIVIL ENGINEERS, Mexico, D. F., and the Mexican Government, extended an invitation to a group of prominent engineers in the United States to attend the First International Civil Engineering Congress, held recently in Mexico City. Howard F. Peckworth, managing director, American Concrete Pipe Association, Chicago, Ill., presented an address before the group titled "Modern Concrete Pipe."

Pavement Yardage

AWARDS of concrete pavement for the month of June and for the first six months of 1949 have been announced by the Portland Cement Association as follows:

	Square Yards Awarded During June, 1949	Square Yards Awarded During First Six Months, 1949
Roads	4,791,826	13,123,689
Streets & Alleys	2,386,923	8,615,724
Airports	787,131	1,303,326
Totals	7,965,880	23,042,739

Stone Company Sold

THE WAUKESHA LIME & STONE CO., Waukesha, Wis., has been sold to Charles A. Coburn by Mrs. M. O. Gillen, company president. Mr. Coburn formerly was executive vice president of the Carbon Limestone Co., Youngstown, Ohio. The Waukesha firm produces rock wool, liming materials, terrazzo stone, chicken grits, building stone and gravel.

A.I.M.E. Meeting

THE AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS will hold its mid-year meeting September 25-October 1 in Columbus, Ohio. Technical sessions will be devoted to mineral benefication and related fields, and one day has been set aside for field trips to mineral industries in the state.

New Headquarters

GOODAT RAINIER SAND & GRAVEL CO. has moved into new and permanent headquarters at 1735 South East Union, Portland 14, Ore.. Walter Goodat, owner and general manager has announced.

Halliburton's Cement Plant Construction Progress

WHAT IS BELIEVED to be the first cement plant operating on oyster shell to employ closed-circuit systems for both raw and finish grinding will be in operation by November of this year. The facilities now under construction for Halliburton Co., Corpus Christi, Texas will have a productive capacity in excess of 4000 bbl. per day, and provision has been made in design for a future increase of one-third without a proportionate outlay of additional capital.

Raw materials for this mill are being dredged from reefs in Nueces Bay, and clay is recovered from an extensive deposit nearby. These are towed to the plant in barges, necessitating the dredging of a short canal under one end of a 100- x 700-ft. overhead crane runway. Ten 30- by 100-ft. concrete silos will be used for storing clinker rather than the usual practice of open storage.

A 16-in. hydraulic dredge for recovering and washing raw shell is now under construction at Tell City, Ind., by the Marine Division of Maxon Construction Co. The washing system for this dredge is being designed and engineered personally by Erle P. Halliburton, Sr., head of the Halliburton Oil Well Cementing Co. The MacDonald Engineering Co., Chicago, Ill. is credited with all foundation work and machinery installation.

Choice of location for this mill was based on the steady industrial growth of the Corpus Christi area, and it is also ideally located for water shipments into the Central and South American markets. For rail shipments, the Southern Pacific, Missouri Pacific and Tex-Mex railroads are available.

The new company is owned and operated by Erle P. Halliburton, Sr., and his wife, Vida C. Halliburton.

Plant Expansion

COLUMBIA GYPSUM PRODUCTS, INC., Spokane Valley, Wash., is constructing a $200,000 addition to its facilities, H. A. Andrews, general manager of the firm, has announced. The new building will house a gypsum grinding and plaster plant, and when completed will increase present capacity to 500 t.p.d. of agricultural gypsum, plaster, wall board and lath.

Chemical Industries Exposition

THE 22ND EXPOSITION of Chemical Industries will be held in Grand Central Palace, New York, November 28—December 3, with exhibits composed of raw materials, machinery and products covering all recognized industrial and commercial application of chemical materials.

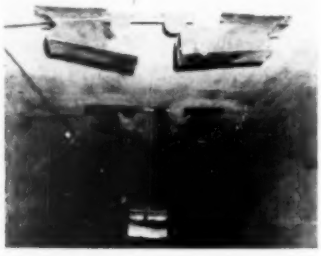
HINTS and HELPS

PROFIT-MAKING IDEAS DEVELOPED BY OPERATING MEN

Stockpile Over Tunnel

EXTENSIVE alterations were made at a sand and gravel plant near San Diego, Calif., recently when the plant was changed from a wet to a dry operation so as to better serve several black top plants in the vicinity. Among the changes was a new stockpiling system which was arranged so that most of the materials produced can be stored in ground storage above a good-sized concrete tunnel. Trucks enter the tunnel at one end, receive a load through a series of gates, and exit at the opposite end. Altogether, there are 16 pairs of gates in the tunnel. These are hinged at the back so that flow of material can be controlled by raising or lowering the lip.

Large concrete tunnel for direct loading from stockpiles



Hinged gates load trucks entering tunnel

Entrained Air Determination

An example of the usefulness of a network chart is the chart, shown herewith, one designed for solution of the equation given in A.S.T.M. Method C185-44T.

The mortar weight is determined in the specified manner and the point of intersection of a vertical line drawn from this value and a horizontal line drawn from the *Ml* value will be located nearest the diagonal line representing the per cent air in the mortar.

Example solution:—

Given the values, $Ml = 185$ and $W = 915$, the calculation by means of the equation is,

$$100 - \frac{1830(182.7 + (185/300))}{(5000 + 10(185/300))}$$

or, 20.4% air.

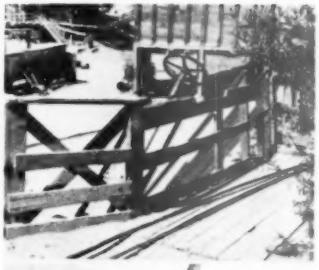
Using the chart, the 90 deg. intersection of lines drawn from 915 and 185 locates a value of 20.5%, read to the nearest 0.5%.

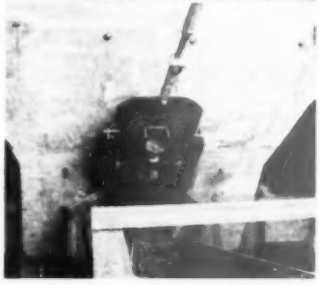
This chart is intended for use with cement having a specific gravity of 3.15.

For use with cements of different gravity, 0.4% should be added to or deducted from the chart value for each 0.10 increase or decrease in specific gravity.

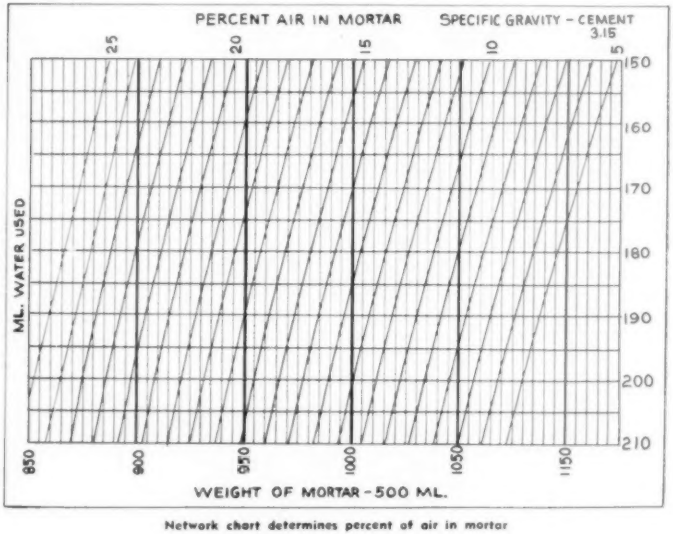
Long Gate Handle

F. G. FENTON MATERIAL CO., San Diego, Calif., at its Murry Canyon plant, uses a 15- x 30-in. Pacific jaw crusher for primary crushing. The crusher is served by a belt conveyor which in turn receives its feed from a concrete truck hopper. Outlet of this hopper has a slide-type gate located at an inconvenient point well below the place where the trucks dump to the hopper. To open and close this gate, a long rod has been provided, the lower end of which works on a worm gear principle. The rod is turned by an old automobile steering wheel fastened to the top.





Top and bottom of long gate handle which opens hopper gate



Network chart determines percent of air in mortar

Double Spout Minimizes Aggregate Segregation

SAND IS PROCESSED from a minus ¾-in. granite material at Clark's Hill dam, near Augusta, Ga. This granite material is stockpiled from a stacker

Segregation of aggregates is corrected with a double spout at the end of stacker belt

belt, and as can be expected, the coarser sizes segregated at the perimeter of the pile. When material was reclaimed by belt conveyor via a small Jeffrey vibrating feeder, the peripheral discharge, Marcy rod mill being used for crushing, would receive variable feeds—sometimes all fines, sometimes all coarse. As requirements were very strict, rod mill operation was difficult, so the operators placed two spouts at the outboard end of the stacker belt as shown in the illustration. This corrected the trouble to the extent that sand produced met all requirements.

Home-Made Crane for Lifting Pipe

A CONCRETE PIPE PLANT in west Texas is using an old truck, equipped with a home-made crane, for handling and loading of the pipe. A section of relatively large diameter pipe has been mounted on the front end of the truck as a counter balance. To lift pipe, a short section of metal rod, fastened a little past its center to the hoist cable, is placed in the pipe to

Crane mounted on truck for loading and handling concrete pipe

be lifted. When the cable begins to hoist, the shorter section of the rod binds in the pipe, permitting it to be lifted. Slacking off of the cable loosens the rod to free the pipe.

Dislodging and recovering rock at top of quarry

Hinged Grizzly

AT A PLANT in the Southeast where a hard crystalline granite is processed, the quarried stone is first crushed in a 48- x 60-in. Allis-Chalmers jaw

Hinged grizzly, held by cable, can be lowered into position to receive oversize

crusher. The 9- to 10-in. discharge product is delivered by inclined belt conveyor to a stationary scalping screen ahead of the secondary crusher, with oversize from the stationary screen falling to the crusher. If desired, however, a hinged grizzly can be lowered into position so that the oversize, instead of going to the secondary crusher, will first pass over the grizzly which has about 8 in. openings. In the illustration, the top end of the grizzly is seen held out of operating position by a steel cable. The oversize then flows to an off-bearing belt conveyor and thence to gondolas. The truck tire acts as a bumper for the rock where it impinges onto the off-bearing belt.

Dislodging Loose Stone

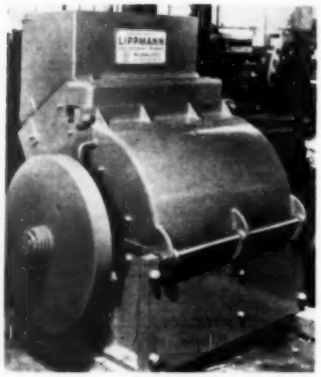
MANY QUARRIES have a "brow" or overhang of loose rock that has to be barred down using various expedients that range from men working from long safety ropes to specially-devised ladders. The work is costly, and in many cases dangerous. The photograph shows a Northwest pull shovel more easily accomplishing this purpose. Mounted above the rim of a quarry face in the south, it not only dislodges loose rock, but recovers some of it which is loaded to Euclid trucks. An important feature is that any seams of off-grade material that often occur in the top of quarries can be cleaned out with this type of unit and the material kept out of the crushing plant.

New Machinery

ROCK PRODUCTS

Pulverizer

LIPPMANN ENGINEERING WORKS, Milwaukee, Wis., has introduced a 32- x 36-in. pulverizer which features a non-choke steep angle feed chute, ex-



Pulverizer will be used to turn out 60-210 tons of agricultural limestone per hr.

panding crushing chamber, spider-type congestion relieving rotor, forged hammer arms, four-edge wear abrasion resisting steel grate bars, one piece four-edge wear hammers, and manganese and abrasion resisting steel armored wearing surfaces. Also featured is a larger than standard feed opening to permit the entrance of extremely large rocks for primary reduction purposes. The grate bars are removable for production of road aggregate.

Air Entraining Agent

NOPCO CHEMICAL CO., Harrison, N. J., has developed a low-cost sodium soap of a partially heat-treated and polymerized fatty acid-resin mixture for air entraining portland cement. It also is being recommended as an additive for mortar cement and for use in block production. Marketed under the trade name, Ertrane C, the product is said to assure uniform quality cement.

Gear Oil Filter

TRANSMISSION DIVISION, FULLER MANUFACTURING CO., Kalamazoo, Mich., has developed a transmission oil filter for continuously cleaning gear oil of grit, grime and abrasives. Consisting of a stamped housing with a replaceable filter element, the unit can be attached to all transmissions equipped with standard SAE six bolt short length power take-off openings. The six capscrews used to attach the power take-off cover plant also can be used to attach the new oil filter to the opening, the manufacturer states.

Transmission oil is forced into the filter housing and through the filter under pressure developed by the rotation of the transmission gears and shafts. As the oil is forced through the filter, foreign matter suspended in and circulating with the oil is deposited on the replaceable filter element and in the sump at the bottom of the housing. The cleaned oil is then channeled back into the transmission case.

Boring Out Kiln Rings

F. L. SMIDTH & CO., New York, N. Y., has made available data and illustrations of large boring bar machines as manufactured by F. L. Smidth at Copenhagen, Denmark, for removal of clinker rings from rotary kilns. They are not essentially new machines but are announced herewith for the first time to the American cement industry. The boring bar is inserted in the kiln to scrape off or dislodge clinker ring without interfering with normal kiln operation. Among the largest to be installed by the Danish plant was placed in a cement mill in Luxemburg. It weighs 24 tons and measures 68.9 ft. in length by 23.6 in. in dia.

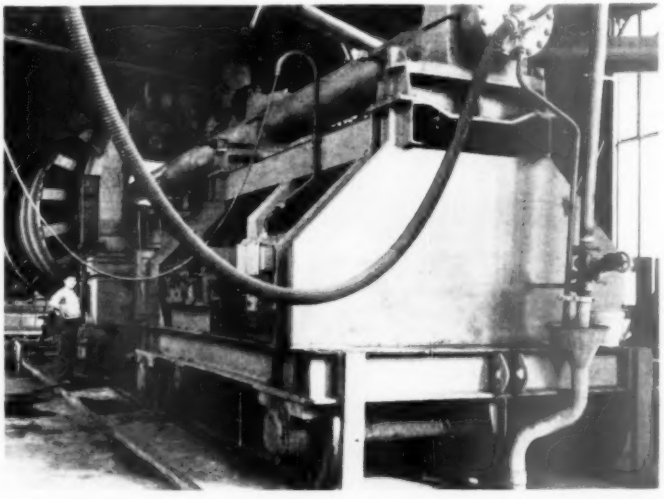
Truck Axle

THE TRUCK EQUIPMENT CO., INC., Buffalo, N. Y., has added the Duaload Third Axle to its line of Truxmore truck axles. The new unit, designed to

Truck axle for doubling payload of two axle trucks

double the payload of two axle trucks, was introduced to give truck operators the economic advantages of a quality third axle at a low price, the manufacturer states.

The Duaload is essentially the same as the Truxmore with the following exceptions: two heavy-duty Hotchkiss drive axle spring brackets and a long spline Universal joint replace the radius rods; two 5½- x 4-in. rubber bearings replace the gravity spring suspension and cross shaft spherical bearings; a box beam is used instead of the spring leaf cross member and



Large boring bar fabricated for removing rings in a rotary cement kiln in Europe. This machine weighs 8.5 tons and mounts a bar 52.5 ft. in length with a diameter of 19.5 in.

two 3½- x 4-in. threaded bushings in the walking beams and threaded cross shaft ends replace the two cross shaft roller bearings.

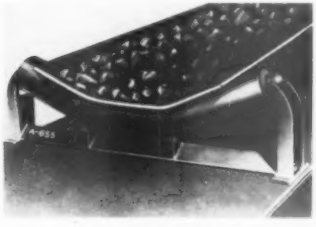
The Duaload is furnished with matching wheels, brakes and track; glove fit frames, telescoping those on the truck, extending from well under the cab to end of body; hydrovac booster kit with reserve tank and 1 ¾-in. compensator for all six brakes and one pair of complete drive axle springs with O and S bearings. The load shifter permits either 50-50 or 60-40 load distribution.

Walking Dragline

BUCYRUS-ERIE CO., South Milwaukee, Wis., has announced the 500-W electric walking dragline with bucket capacities ranging from 8 to 12 cu. yd. and booms from 165 to 205 ft. The unit features individual drag and hoist motors and twin draglines. Working weight is 1,275,000 lb. Maximum dumping of the 205-ft. boom is 107 ft., and with the same length boom at a standard working angle, the excavator can dig 135 ft. below the surface on which it rests. Material can be moved 416 ft. horizontally without throwing the bucket, the manufacturer states. The circular working base of the 500-W covers 804 sq. ft.; weight and loads are balanced so that the center of gravity shifts within pre-determined safe limits. The dragline walks with 7-ft., 4-in. steps on shoes 37 ft. long and 6 ft. wide. Generator units are laterally placed in the rear of the house so that digging vibrations are normal to the bearings.

Belt Conveyor Carrier

STEPHENS-ADAMSON MFG. CO., Aurora, Ill., has developed the SealMaster Ball Bearing Belt Conveyor which features lightweight construction, low power requirement, minimum maintenance, one shot low pressure lubrication, and interchangeable parts with no tools or adjustments required, the manufacturer states. The belt idlers feature rigid, one-piece, welded steel frames, designed to tilt in the direction of the belt travel and keep the belt centered without need for guide rolls. An inverted angle base and specially designed end brackets shed material and keep roller free. Six permanently sealed, self-aligning ball bearing units, independent of their housings, are arranged for the aforementioned one shot lubrication from either side of the carrier. Ball bearings and hollow live shafts turning with rollers are said to reduce friction and prolong the life of the carrier.

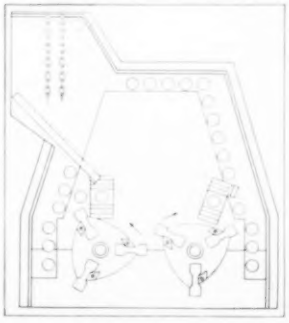


Ball bearing belt idlers

Electric walking dragline being used to strip overburden

Double Impeller Breaker

NEW HOLLAND MANUFACTURING CO., Mountville, Penn., has announced the Model 3030 double impeller breaker for primary crushing. This is the second breaker being produced by the company for handling stone passing a 30-in. opening. New design of the second model is said to permit the feeding of longer slabs without bridging, resulting in greater production. Major change in the new model is the relocation of the adjustable breaker bar over one of the twin impellers in the breaking chamber. The first model has the bar directly over each impeller and a vertical path. The new model has the relocated bar over the impeller opposite the feed chute, and the bar is adjustable upward and outward to permit feeding of the longer material. In the illustration the dotted line at the right shows the former area of adjustment for the breaker bar set over the impeller at right. The solid line shows how the breaker bar is now adjustable outward and upward to permit feeding longer slabs.



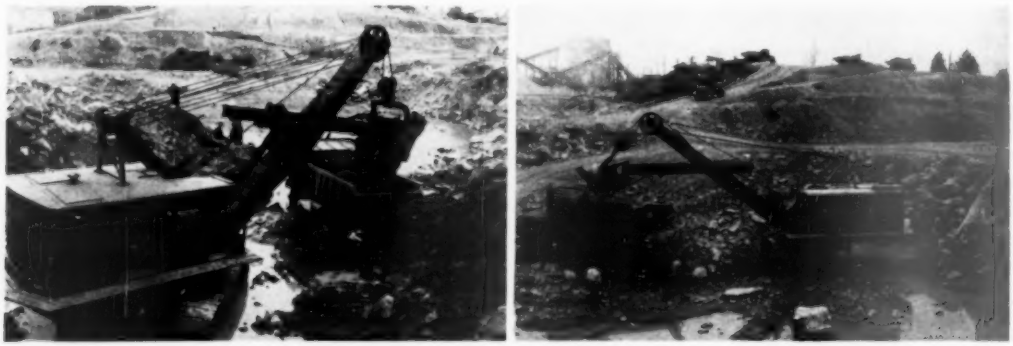
Cutaway view of double impeller breaker

Materials Handling Tractor

TRACTOMOTIVE CORP., Deerfield, Ill., has developed the Model TL-B Tracto-Loader which has a 10-cu. ft. standard bucket over the driving wheels and the steering wheels in the rear. The bucket, hydraulically controlled, can be dumped in whole or in part to a height of about 5 ft., and has a forward crowd action and automatic "tilt-back" feature that permits getting a load without ramming, the manufacturer states.

Overall length of the unit, which is mounted on rubber tires, is 9 ft., 5 in. with bucket down; overall width, outside tire measurements, is 4 ft., 6 in.; and the wheel base is 4 ft., 1 in.

Loader with 10-cu. ft. bucket



Two 2½-cu. yd. diesel-powered shovels used in the quarry to load to 13-cu. yd. rear-dump trucks for the haul to the primary crusher. Note trucks, upper right in right-hand picture, about to dump to hopper serving primary crusher

Process 300 t.p.h. of Granite

Belt conveyors, vibrating feeders, two jaw and two cone crushers, both wet and dry screens at McLeansville, N. C., operation of Superior Stone Co.

SUPERIOR STONE Co. owns granite quarries at Red Hill, Va., and Burkes County, N. C. The Red Hill plant went into operation in 1947 and a description of this plant appeared in the August, 1948, issue of ROCK PRODUCTS. The company also owns the King's Mountain, N. C., limestone quarry and the Bellgrade, N. C., shell-rock operation. The newest operation is the McLeansville, N. C., plant which is located between Burlington and Greensboro. The company also operates a plant at Ramseur, N. C.

Head offices of the company are in Raleigh, N. C. W. T. Ragland is president and E. U. Ragland is vice-president. R. B. Arthur, vice-president, is in charge at McLeansville, with A. D. Hagwood as superintendent. E. Lee Heidenreich, Jr., is consulting engineer.

McLeansville Operation

The McLeansville operation, known as the Reuben quarry, is a granite quarry. At the time of inspection the dry portion of the plant was operating, with the wet screening section still in the construction stages. A considerable area of the quarry had been stripped, with these strippings ranging from 0 to 10 ft. Some of the stripped material had to be blasted. At time of inspection a cut was being taken in the quarry about 30 to 32 ft. thick. A fleet of five, 13-cu. yd. Euclid rear-dump trucks was delivering quarry rock to the primary crusher. The up-hill pull was over easy grades and to a dirt ramp from which the trucks dumped to an apron feeder serving the first crusher.

Blast-Hole Drilling

All the primary drilling in the quarry was being done with an Ingersoll-Rand Quarrymaster drill. Holes were drilled to 34 ft. with a 5½-in. dia. Carset, cross-type bit being used. This bit uses tungsten carbide at the cutting edge. Here the average life of the bit was 500 to 600 ft. of hole with drilling rates of 4 ft. per hr. This granite has a Los Angeles rattler rating of 25 percent. The only comparison available at time of inspection regarding the performance of a churn drill in this type of rock was through an independent contractor who put down a 110-ft. water well for the company. His drilling rate was said to be 5 ft. per 8 hr., or roughly 0.6 ft. per hr. The Carset bits are sharpened by grinding from time to time and one bit was re-dressed 18 times, giving 734 ft. of hole, but with some loss in gauge. For secondary drilling the company has 9 Ingersoll-Rand jack-

(Continued on page 194)

Left foreground: Dry screening plant. Note extensive use of belt conveyors

Aerial view of Davison Corp., Phosphate Rock Division's plant near Lakeland, Fla. New flotation plant, left center; table plant, lower left; washer plant, lower center; 40-ft. raw-feed storage bins, lower right; 150-ft. hydroseparator, upper center and part of 400-acre settling pond, top

High Phosphate Recovery Through Use of Froth Flotation

Large dewatering areas, hydroseparators, flotation cells and conditioner tanks incorporated in Lakeland, Fla., plant of Davison Chemical Co. in processing accumulated rejects and fresh raw materials

By WALTER B. LENHART

SOILS WHERE fertility is becoming exhausted by repeated harvests may result in an agricultural paralysis, the effects of which would touch the lives of everyone. Agronomists have found that some soils can produce an abundant crop as far as bulk is concerned, however, these crops may be practically worthless from the nutritionist's standpoint and lack the necessary vitamins to be of any real food value. The plant must get these vitamins and other energy producing elements from the soil. These elements and minerals are a wasting asset, and if used up by previous plant life, they must be replaced.

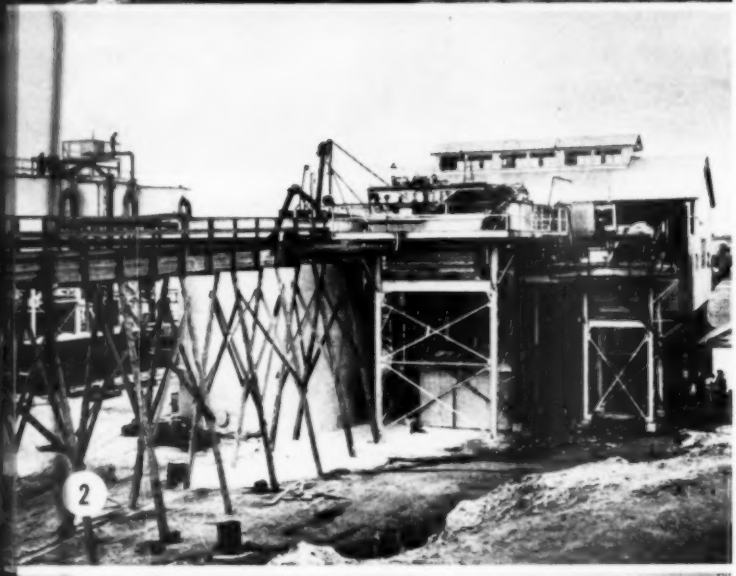
The next step in the degradation of the soil is a drop in the bulk or weight of the harvest and ending in practically total sterility. Following sterility comes erosion. A fertile soil won't erode, agriculturists say. Millions of future lives are literally being washed into the sea. One has only to look at China to see what happens to the over-all economy of a once great empire when soil productivity falls behind the population's needs—civic unrest, plagues, starvation, wave after wave of futile civil wars, ending only when the people are not hungry.

Extraction Methods

Phosphate of lime has long been accepted as an essential ingredient of fertilizers and this country is fortunate to have large deposits that can be distributed to the farms at a relatively low cost. But any mineral deposit, no matter how large, can, over the years, approach exhaustion and when that time comes we will pay for it in one form or another.

Phosphate producers are keenly aware of this fact, and during the past years older methods have been replaced by modern ones that attempt to extract every possible pound of phosphate of lime from the deposit, exclusive of clay content. Operators were far-sighted enough to store the rejects from the older plants, looking forward to the time when a process would be developed so that these piles of rejects could profitably be reworked. The application of the flotation process to this problem has met with eminent success and each year more and more operators are adapting that technique. Not only are the newly-mined phosphate materials being treated by flotation, but the large accumulations of rejects from previously worked ores are being retreated in modern plants of large capacity to produce marketable products.

During January of this year, Davi-



son Chemical Corp., Phosphate Rock Division, placed a new phosphate flotation plant in operation south of Lakeland, Fla. The plant is an addition to the Pauway No. 4 washer and table plant that processes phosphate material from Division's Pauway Mine No. 4. The new installation is modern in design and represents an investment of half a million dollars. It was constructed by Western-Knapp Engineering Co., San Francisco, Calif., with construction starting in June of 1948. The operation of the new plant is adding about 85,000 tons of high grade phosphate material to the company's annual production.

General Layout

The flotation plant was designed by Mineral Separation North American Corp., Lakeland, Fla. and utilizes the latest scientific procedures. Its primary purpose is to save the finer phosphate materials that formerly were sent back to the debris storage ponds. Some of the raw material now going to the washer comes from accumulated piles of debris from older washer operations. The plant features the use of a 66-in. duplex Akins spiral classifier that is said to be the largest of its type ever built. The main flotation plant is an all-steel structure mounted about 16 ft. above grade and is provided with expanded steel metal floors and stair treads.

Mine operations are on a two shift basis: the afternoon and the graveyard, and the plant operates only when the mine is being worked. This enables the day crew to make all plant repairs and the mining crew to move pipe and pumping equipment and do other related work. Mining operation centers around the use of a 9-cu. yd. Bucyrus-Erie dragline and follows somewhat the general practice of the Florida phosphate fields with hydraulic monitors to wash the matrix that the dragline has dug to the suction of 12-in. Georgia Iron Works Sand pumps. These in turn deliver the material to the washing plant through extensive pipe lines.

The older washing plant for the phosphate rock features the use of two double log washers and two Hardinge conical ball mills that act as scrubbers. This equipment is operated with the idea of washing the coarser sizes free from attached foreign matter and without undue grinding or crushing of the phosphate material. Raw phosphate materials in the minus 20-mesh, plus 48-mesh range are concentrated in a table plant that uses 35 Deister Concentrator Co. tables. Minus 48-mesh material, formerly wasted, is sent to the float plant.

No. 1: At left is the flotation plant, with reagent storage tanks in left foreground. No. 2: Detail of the flotation plant; top center, 66-in. duplex spirals and center right, simplex spiral. The latter is one of the de-oiling units. No. 3: 150-ft. hydroseparator, foreground (note weir), and portion of settling pond, background

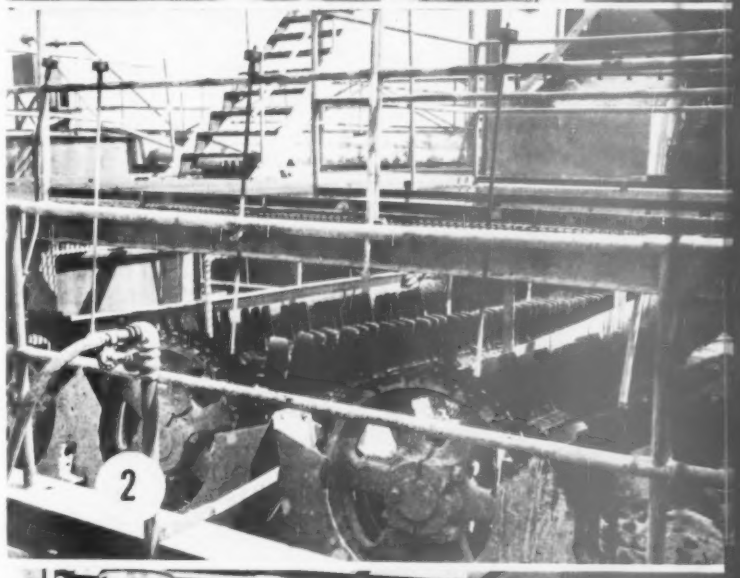
The flotation plant operates with two men per shift: one is the operator and the other acts as oiler and looks after the reagent feeders. The four men now running the plant were trained for this work in a series of classes conducted by the company's Process and Quality Control group.

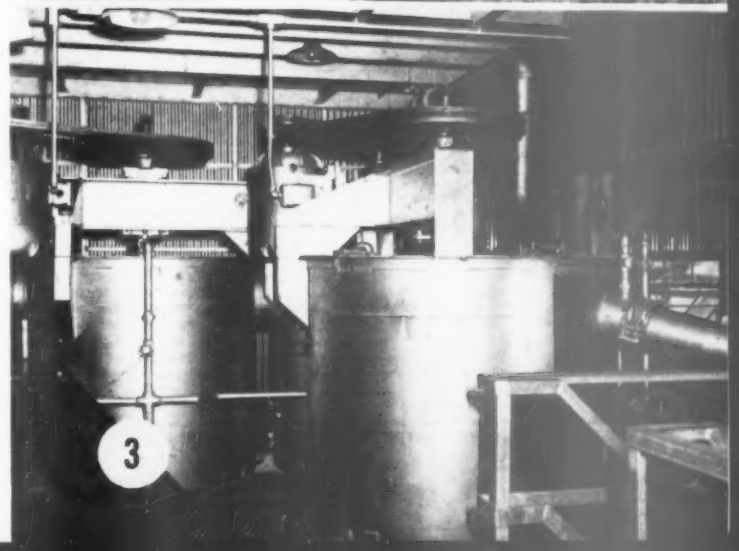
All the washer debris flows to a 150-ft. dia. Dorr Co. hydroseparator as the initial step in the flotation installation. The overflow from this thickener is mostly slimes in suspension and is sent to settling ponds that cover about 400 acres of ground. Clear water from this settling pond is re-used in the washer. The underflow or settled portion from the hydroseparator is picked up by a 12-in. G.I.W. pump that is powered by a 200-hp. motor. It delivers to three, 40-ft. dia., steel storage tanks. These tanks are equipped with circular over-flow weirs so that any material not settling in the tanks is collected and returned to the 150-ft. hydroseparator. Many of the storage bins in the plant are similarly constructed.

Reclaiming Solids

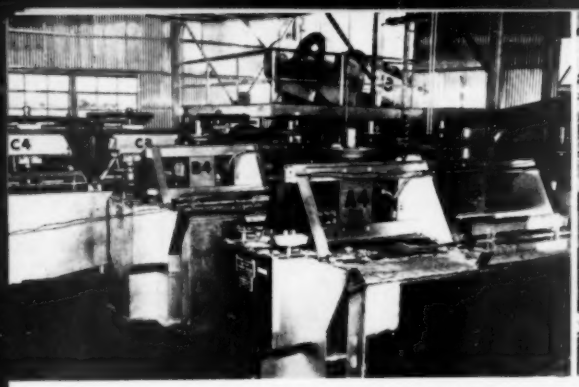
The solids in the storage tanks are reclaimed by one of two G.I.W. pumps, both 8-in., which are driven by 150- and 200-hp. motors, respectively. The suction line of these pumps extends into the bottom of the tanks, and by means of a small water line installed near the open end of the suction pipe, water can be admitted, acting as a lubricant so that the fine solids can be easily pumped out of the tanks and to a vibrating screen ahead of the Allen cone. This scalping screen is equipped with ¼-in. wire and oversize goes to the washer. The undersize from the screen flows to six, 10-ft. Allen cones, the overflow of which goes to a 40-ft. Dorr Co. hydroseparator. The overflow from this smaller hydroseparator returns to the large 150-ft. unit. The settled solids in the cones go to a battery of four, 8-pocket Fahrenwald hydraulic classifiers. The under-flow from the 40-ft. hydroseparator goes to a 30-ft. dia. x 30-ft. flotation feed bin. The sizers produce three sizes of phosphate material. The coarse size is pumped to a bin in the washer, the intermediate size (ranging from about minus 20-mesh to plus 48-mesh) is pumped to the table plant, and the overflow is pumped to the previously mentioned 40-ft. hydroseparator.

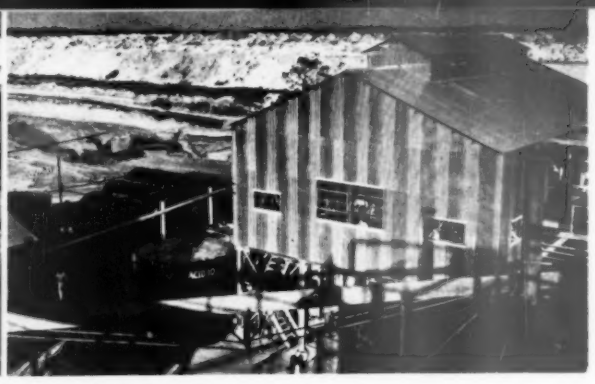
The 30-ft. flotation feed bin is emptied by an 8-in. Pettibone Mulliken pump that delivers to a 66-in. dia. Akins, duplex, submerged-type, dewatering spiral classifier. This classifier is powered by a 15-hp. motor



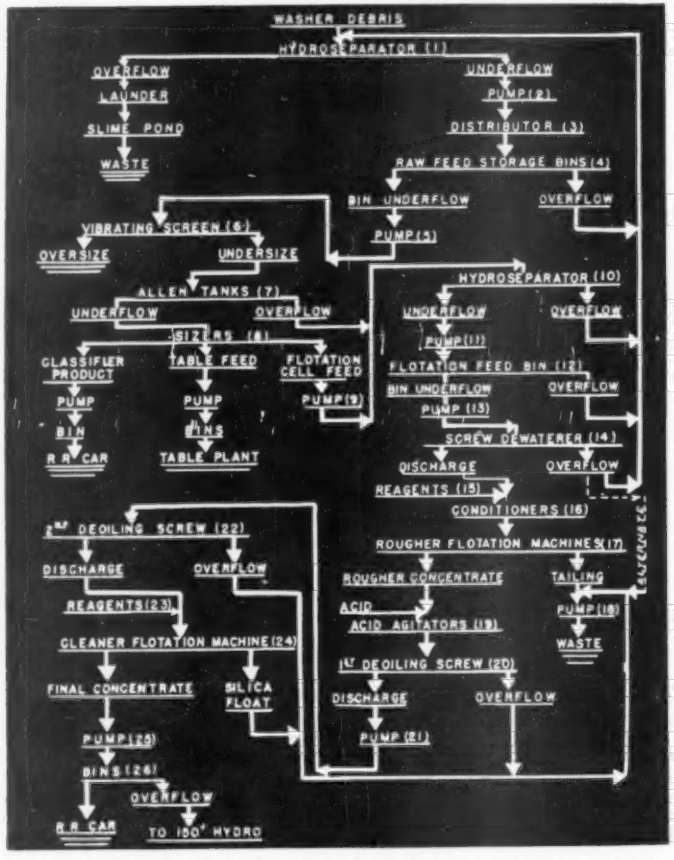


No. 1: Overflow from these hydroseparators, mostly slimes in suspension, is sent to settling ponds. No. 2: An important step in preparation of material is its passage through these log washers. No. 3: There are a total of four of these 5- x 5-ft. conditioners in the flotation plant that operate in pairs





Left: Banks of 4-cell rougher cells, and right, flotation plant and chemical storage tanks



Pauway No 4 flotation plant flowsheet. Key: 1. 150-ft. dia. hydroseparator, 30-hp. motor. 2. 12-in. centrifugal pump, 200-hp. motor. 3. 3-way distributor box. 4. Three 40-ft. dia. bins, 150-ton capacity each. 5. Two 8-in. centrifugal pumps, 150-hp. motor each. 6. Vibrating screen, 60 x 102 in., 3-hp. motor. 7. Six 10-ft. tanks. 8. Four 8-pocket sizers. 9. 12-in. centrifugal pump, 200-hp. motor. 10. 40-ft. dia. hydroseparator, 10-hp. motor. 11. 8-in. centrifugal pump, 75-hp. motor. 12. One 30-ft. dia. bin, 900-ton capacity. 13. 8-in. centrifugal pump, 75-hp. motor. 14. Dewatering classifier, 66-in. duplex screw, 15-hp. motor. 15. Phosphate flotation reagents: caustic soda, fuel oil and oil. 16. Two 5- x 5-ft. duplex conditioners 30-hp. motor each. 17. Two 4-cell airflow flotation machines, two 30-hp. motors each; and one 4-cell flotation machine, 30-hp. motor. 18. 12-in. centrifugal pump, 350-hp. motor. 19. One 5- x 5-ft. duplex conditioner, Neoprene-lined, 30-hp. motor. 20. Primary de-oiling classifier, 6-in. simplex screw, 7½-hp. motor. 21. 6-in. centrifugal pump, 50-hp. motor. 22. Secondary de-oiling classifier, 60-in. simplex screw, 7½-hp. motor. 23. Silica flotation reagents: amine, caustic soda, kerosene. 24. One 6-cell airflow flotation machine, three 30-hp. motors. 25. 6-in. centrifugal pump, 100-hp. motor. 26. Concentrate bins: Two 20-ft. dia., 200-ton capacity each and one 22-ft. dia., 300-ton capacity or a total of 700 ton concentrate capacity

which is equipped with a Foxboro load-recording indicator. The overflow from this spiral and the overflow from the 30-ft. flotation feed bin return to the 150-ft. hydroseparator.

The Akins spiral delivers the solids to a battery of four Denver Equipment Co., 5- x 5-ft., paddle-agitated conditioner tanks. These operate as two banks of two tanks each in series and in these tanks are added the fatty acids and other reagents used to float the phosphate materials. The conditioners serve the rougher flotation cells consisting of two, 4-cell, Minerals Separation No. 8 Airflow flotation machines and one bank of 4-cell, No. 30 Denver flotation cells. These cells produce a tailing and a rougher concentrate.

Acid Agitator

The rougher concentrates go to an acid agitator. This is one unit, a 5- x 5-ft., two-cell rubber-lined Denver conditioner, where sulphuric acid is added to the concentrate as one of the steps in deoiling it, and preparing it for the amine cleaner flotation circuit that follows later in the process.

The acid agitator discharges to a simplex, 60-in., Akins, submerged-type spiral that acts as the first de-oiling unit. Its overflow goes to the tailing sump. The solids are pumped by a 6-in. Wilfley pump to a second 60-in. simplex de-oiling spiral. The overflow from this spiral also goes to the tailing pump. The dewatered material flows to the silica flotation cells. Here the flotation scheme is reversed from the first one as the silica is floated in a froth that goes to the tailing pump. The non-floating product is the cleaned concentrates which are picked up by another 6-in. Wilfley pump which delivers the material to the shipping bin. There are three concentrate bins.

All the previously mentioned tailings flow to a concrete sump that is provided with a 12-in. G.I.W. pump that is powered with a 350-hp. G.E. motor. This pump starts and stops automatically and delivers the tailings to the settling pond.

Large capacity steel storage tanks are available for storing flotation reagents, some of which are shipped to the plant in carload lots such as fatty

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Slackline Cableway Operation In Northwest Gravel Plant

Jones-Scott Co., Umatilla, Ore., has expanded plant for anticipated larger demands in territory where McNary Dam is being built

SINCE 1914 the Jones-Scott Co. has had a small gravel operation at Umatilla, Ore. Company officials, looking forward to the demands that were sure to come when the nearby McNary dam got underway, rebuilt the plant last year.

Umatilla is a small town about 190 miles up the Columbia river from Portland, Ore. About three miles above Umatilla the Corps of Engineers, U. S. Army, is building what is now known as the McNary dam (formerly called the Umatilla dam). This structure will cost around $200,000,000 and will generate about one million horsepower. McNary dam is well above Bonneville dam which is about 41 miles above Portland. During the construction of the dam the immediate area probably will experience a building boom to house construction workers and fill their needs. When the dam is completed there no doubt will be a change in the entire economic structure of the area, and the Jones-Scott Co. is anticipating substantial demands for sand and gravel that will justify the new plant.

Plenty of good gravel flanks the south banks of the Columbia river with the deposits well above water line, forming high bluffs above and along the river. The gravel, for the most part, is a dark material possibly derived from the vast areas tributary to the Columbia river that are dark colored and volcanic in origin. The site selected for the plant lends itself easily to the use of a 2-cu. yd. Sauerman Crescent scraper to deliver the pit run gravel to a hopper ahead of the belt conveyor system serving the plant. The drag scraper is powered by a 100-hp. International diesel. The two-drum hoist carries a ¾-in. pull line and a ⅝-in. return line. The plant has a capacity of 125 t.p.h.

One-cylinder, vertical 50-hp. diesel that drives the roll crusher

Left to right: H. R. Thompson, plant foreman; Laverne Franklin, dozer operator; and J. W. Phillips, welder and truck driver

Material Flow

The drag scraper delivers material to a hopper that is served by a Pioneer reciprocating feeder. A grizzly over the hopper is constructed of pipe on 8-in. centers. The feeder delivers material to the first of four belt conveyors that are a part of the plant. The first horizontal belt conveyor is on 375-ft. centers and is 20 in. wide. It is powered by a 40-hp. motor and was supplied by Hewitt Rubber, Division of Hewitt-Robins, Inc. It has a speed of 250 f.p.m. and discharges to a 4- x 8-ft. dry, two-deck scalper screen which has 4- and 2½-in. mesh, respectively. Oversize from the top deck falls to a 10- x 36-in. Telsmith jaw crusher. This crusher is driven by a 37½-hp., single cylinder, vertical, Fairbanks, Morse diesel engine through flat belts.

Belt conveyor emerging from tunnel under field pit that receives material from drag-scraper

Undersize from both decks and the plus material on the lower deck of the scalper can go two ways. It can fall to a short, inclined, 18-in. belt that delivers to a two-deck, dry, 3- x 10-ft. Symons screen which is mounted on top of a wooden truck loading bin with the assembly at right angles to the main belt conveyor system. This screen has a top section of 1¾-in. mesh and an end section of ½-in. mesh. The lower deck has a top section of ⅜-in. mesh and an end section of ¼-in. mesh screen cloth. The

(Continued on page 191)

Distribution and Fuel Conservation

Freight absorption with modifications likely will follow if right to absorb freight is legalized; substantial fuel savings being accomplished through long kilns and improved kiln operation

By BROR NORDBERG

LIKE ALL INDUSTRIES, portland cement manufacturers are planning and taking steps in preparation for the time when competition will determine the course of business. They are fully aware of the fact that the industry has in the past always operated at but a part of its ability to produce cement, with the exception of the past two or three years, and operations that are being rehabilitated are being done so with the view to attainment of the lowest possible cost of production and distribution.

All major plant reconstruction programs are being geared for the day when low unit cost will be more essential than now and, therefore, the types of installations being made in all departments of cement mills bear close study.

At this time, three subjects seemed of most immediate importance to us in planning this annual August cement issue of ROCK PRODUCTS. First, the marketing of cement, in view of the basing point decision and greatly increased freight rates, appeared to be of foremost interest to manufacturers; secondly, fuel conservation and firing efficiency in view of high fuel cost and comparatively poor quality of coal today; and thirdly, research and its approach because of the concern of engineers and purchasers for the alleged premature failure of some concrete structures.

Articles that follow in this issue emphasize these three subjects principally, and those that discuss plant modernization largely deal with these same topics from the standpoint of operating practice. In our consideration of fuel conservation, some emphasis is given the role of instrumentation for therein, in the opinion of many manufacturers of cement, is the key to controlled firing practices.

Here, we comment more generally on these same three subjects, based on our own observations and opinions and those of others who are directly active in the industry. Our annual letter to the top executives of cement companies brought an excellent response and we hereby sincerely thank those who contributed so generously to this discussion. More than half the production of the industry is represented in the comments we received.

Basing Points

As this is written, the industry was awaiting the decision of Congress on the O'Mahoney Bill which would remove some doubts about the legality of certain delivered price and freight absorption practices. The Bill would permit a seller acting independently to quote or sell at delivered prices or absorb freight with certain exceptions and conditions, and would definitely kill the idea that mill net is the real criterion of price. However, the O'Mahoney Bill, which would be permanent legislation, does not legalize the use of basing points on the scale formerly practiced. At least, the cement industry would have certain clarification through its provisions and the majority believes the Bill will be passed, because of the implications that the prohibition of basing points have on American industry.

Certain cement manufacturers have continued to absorb freight, since the time basing points were declared illegal, to meet competition in good faith, but many have been sticking to straight f.o.b. mill pricing plus freight to destination at the customer's expense.

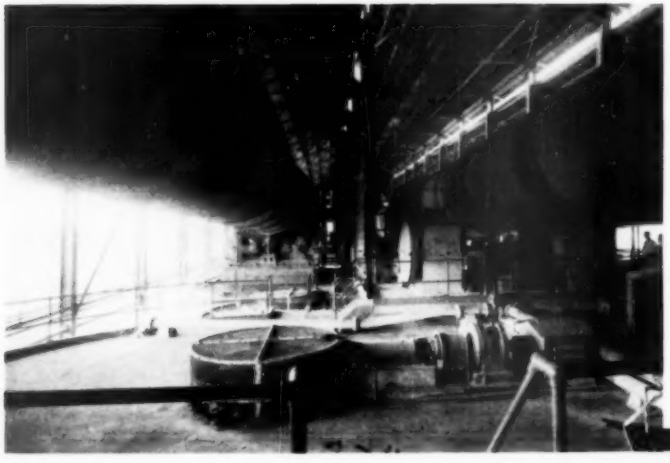
Freight Absorption

If Congress enacts the O'Mahoney Bill, the cement industry will likely be prepared to assume a certain amount of the freight costs now borne by the customer but it appears that the extent of freight absorption practices will be less than in the past. Freight costs have increased markedly percentagewise during the past two years to shrink market areas and, as a result, it has become uneconomic to sell cement in some important markets even if freight absorption be legalized.

While demand for cement, nationally, continues at a high level, some mills in the Southeastern and Midwestern areas reportedly have suffered substantially by their inability to absorb freight, and their rate of operations has consequently suffered. Such mills would be among the first to resume freight absorption. Other companies likely would wait for more intense competition before absorbing any freight. Lehigh Valley plants would go to freight absorption quickly. The effect would be to lower prices in strongly competitive areas.

Whether or not the basing point decision is changed it is doubtful that there will be more plant decentralization which would in some cases

Kiln on left is 10 x 374 ft. with an enlarged diameter zone at Lone Star Cement Corp. plant, New Orleans, La. A control feature is use of thermocouple just below chain section, to maintain uniform flow through kiln as a safeguard against ring buildup



Hold Cement Industry's Attention

appear logical because of high freight rates. However, as pointed out by cement manufacturers, the availability of suitable raw materials satisfactorily located with respect to market areas, and extraordinary high plant construction costs, make much new plant building unlikely. Plant construction costs now are in excess of $6.00 per bbl. of annual capacity, exclusive of raw materials and land, as compared to $2.50-$3.00 not so many years ago.

It is agreed that if f.o.b. mill pricing is continued that some of the badly located plants will be forced out of business and, it may be, some of the plants closer to large marketing centers will be enlarged. Other alternatives will be to raise plant prices and rely on a smaller volume of business in order to survive or to establish distribution centers in favorable marketing areas. Illustrated herewith is one of four new self-unloading barges of Marquette Cement Manufacturing Co. to move cement from Cape Girardeau, Mo., to packing plants at St. Louis and Memphis. Developed by Marquette engineers and Ingalls Shipbuilding Corp., the 195- x 35- x 11-ft. barges holding 8000 bbl. of cement may be towed at 10 m.p.h. or faster. Cement is unloaded by pumps fed cement from a hopper filled by a scraper system.

Freight rates, which have increased almost 60 percent since 1946, are considered more serious in the long term and have the effect generally that f.o.b. mill pricing plus freight would have in restricting marketing areas for a given plant. Many manufacturers say they doubt if they will ever reach out as far for business as before because of increased freight rates; yet they say that the relationship of capital investment for expansion at present high costs to the earning potential at competitive prices make it uneconomic to build or re-locate plants near to markets where there is good demand for cement.

Needed Capacity

Cement manufacturers are unanimous in saying that the industry has sufficient capacity to meet any foreseeable needs for cement in the immediate years ahead. Some of them say that the plants came very close to meeting the extraordinary demands of a year ago. They point to the experience of the steel industry the past several months to show the ill effects of over-expansion.

It was pointed out by one manufacturer that, because there has been no marked increase in production, along with population growth and under uses of cement, that there is a better ratio of capacity to demand than existed in the 1920-1930 period when there was excessive production capacity.

Truck Haul

All cement manufacturers seem to agree that the use of trucks and other forms of transportation other than rail for delivery of cement will increase, even though special loading facilities must be built at considerable expense. The spread between rates for truck and rail haul is greatest on the short hauls.

Manufacturers' Comments

An Eastern manufacturer with several plants said:

"A plant, to be profitable, must be located where there is a source of raw materials, and at the same time convenient to markets for finished products. The two frequently do not go together, so that attractive locations are limited in number.

"The selling price of cement has increased only about 45 percent since 1939, whereas the cost of plant construction is at least two to three times higher than it was ten years ago. In such circumstances the investment return on a new plant can scarcely be sufficient to justify a company's using its cash and borrowing capacity for new construction, and certainly there is little or no appeal to the investing public in securities offered to finance such construction.

A small manufacturer in the Southeast who believes that production is sufficient in his area, said in part:

"This company is located fortunately from a marketing standpoint. Many of our competitors are not, but they fall into both classes and some of them are going to have trouble when times get a little tough as they undoubtedly will. I am of the opinion that some new plants will be established but I think they will be established for the most part by the larger companies which may find certain of their mills badly located from the market standpoint. We would like to have a brand new mill here but if I had the money personally or this corporation had the money, I would not recommend putting it into the portland cement business. I believe there are many fields much better than the manufacture of portland cement for investment. If railroads insist on getting higher rates, undoubtedly other forms of transportation are going to come into the picture. There is sufficient cement in the Southeast this year and in my judgment for some years to come."

A brief comment from a manufacturer in Ohio with one plant was in part:

"In the area in which our plant is located, there is little likelihood of the establishment of new plants, as the present production is more than adequate to supply the projected needs of this district. Consequently, there is

Among most economical (on fuel) kilns anywhere are these 9- x 314-ft. dry-process kilns at Northampton, Penn., plant of Lawrence Portland Cement Co. Coal utilization is about 850,000 B.t.u. per bbl. (see ROCK PRODUCTS, June, 1947, p. 86 and August, 1948, issue, p. 144)

One of the newest complete cement plants in the U. S. is the Portland, Colo., wet-process mill of Ideal Cement Co. (see ROCK PRODUCTS, August, 1948, p. 120)

no need for increased capacity to supply the contemplated demand in this territory.

"There is no centralization of production in this area and, if f.o.b. mill pricing is continued, some poorly located plants might, in a period of low demand, be unable to operate. This could result in the permanent closing of such plants with a possible eventual increase in production at those mills located near the heavy consuming areas. Trucks are being adopted as a means of transportation in some portions of this district, the use of which transportation, in the face of high freight rates, will likely increase.

"The relationship between capacity and demand in this area is in better balance than in former years. During the period of 1920 to 1930, there was considerable expansion, which resulted in over-production. The increase in population together with the increased use of cement, and considering that there has been no appreciable increase in production, places the situation in this area in better balance."

A Lehigh Valley manufacturer commented as follows:

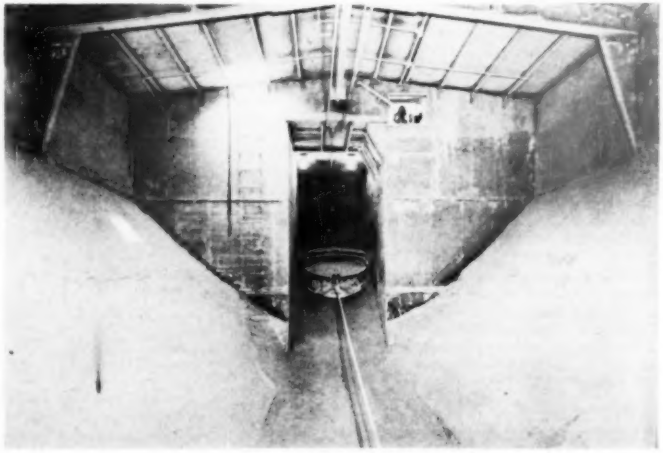
"You are quite right in designating cement distribution as problem number one. While the Supreme Court decision in the Cement Case and the later negative action in the Rigid Steel Conduit Case have cast a shadow of doubt over the legality of meeting competition at the destination, it has been difficult to believe that these two cases deprived us of our constitutional right to dispose of our property, namely cement, in a manner which would permit this company to stay in business. It has also been difficult to believe that so gross an injustice would be permitted to long continue.

"Probably no section of the country has been so adversely affected in both the short and the long term implications than has the Lehigh Valley. We have had enough faith, however, in the two points just mentioned to go ahead with a plant rehabilitation program in the full expectation that we will stay in business and continue to make a reasonable profit so long as we continue to operate with better than average efficiency.

"When we first went into this period last summer there was much talk of new plants, changed methods of distribution, off-plant storage and packing facilities. Such talk seemed to die down as the year progressed. I have heard little of it since then.

"There has been talk of new plants. So far as I know the only plant now under construction is being built by people outside the industry. Another

Interior of new Marquette barge showing arrangement for unloading cement



plant in Southern California which is being seriously promoted is also an outside job. Several industry-built plants have been proposed but, with possibly one exception, construction has been deferred due to high costs.

"To me this provides a key to the situation. It will cost $6.00 per bbl. of annual capacity to build a new plant. This represents a new venture, new territory, new raw materials, new organization, etc. Against that an older plant which may stand on the books at a depreciated value of a dollar or less per bbl. of annual capacity, may be modernized so that its efficiency will approximate that of a new plant for from $1 to $2 per bbl. It seems to me, therefore, that the trend lies in the direction of rehabilitation of old plants rather than in building of many new plants.

"As you indicate, a disturbing factor in cement distribution has been what appears to be a disproportionate increase in freight rates. This has narrowed trade territories and reduced cross hauling. The difference between truck rates and railroad rates are greatest on the short haul. This has been the case for many years and has not led to widespread trucking. Higher freight rates affect the long haul by restricting the trade territory. I doubt, therefore, if higher freight rates will, of themselves, lead to trucking.

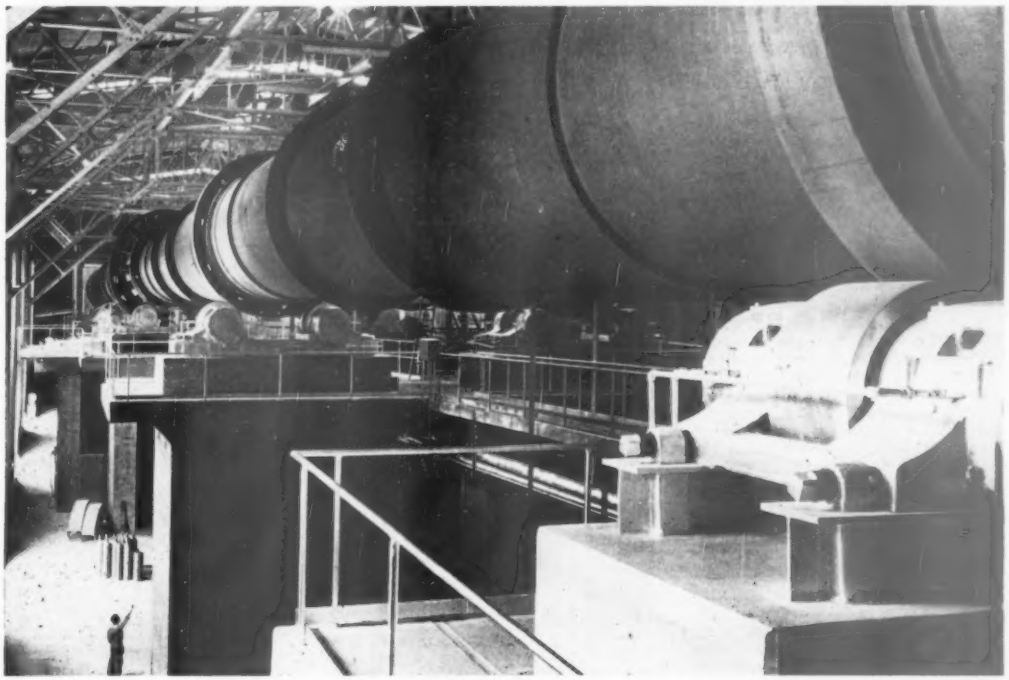
Brand new barge of Marquette Cement Manufacturing Co.

"If 1948 represents the peak demand for cement in this business cycle, the answer to your question regarding capacity of the industry is obvious. There were, last year, some local shortages due to imperfect distribution. I personally question whether the construction industry would have taken an additional million barrels in the northeastern states last year had the industry produced it.

From the South, a cement manufacturer commented on distribution, as follows:

"It appears at this moment that Congress may take some permanent action to permit meeting prices at destination without compelling that resultant net return at the mill be used as an inflexible mill price. If this happens and if, further, parallel action by competitors is freed from an automatic finding of collusion, we think competition in the cement in-

One of two 10- x 400-ft. rotary kilns at Ideal's Portland, Colo., wet-process plant is typical of long kilns with a chain section for drying slurry. Fuel consumption was expected to be in the 1,000,000 B.t.u. per bbl. range at a production of 2000 bbl. per day



Distribution terminal of Missouri Portland Cement Co., built two years ago at Memphis, Tenn., for water delivery of cement from St. Louis

dustry will go back largely to the natural channels that were blocked by the Federal Trade Commission Order. We doubt, however, if mills in general will go as far as they used to on account of the greatly increased freight rates. We expect, too, an increased use of transportation other than railroad. Until Congress acts or refuses to act, we doubt if much action will be taken in the way of additional plants, etc., to facilitate business under the Federal Trade Commission Order. The industry has been making more cement in the past two years than ever before. No doubt expansion will continue in step with the growth of the country, but we see no deficiency of supply at present in the rather limited area with which we are familiar."

Another Lehigh Valley manufacturer said, in part:

"It now appears that congressional action may have salutary effect upon the basing point decision of the Supreme Court, and permit cement companies to meet competition insofar as they are reasonably able. High freight rates are having a more serious and long term effect upon cement marketing areas. Every time the rates go up the market area of a cement plant shrinks proportionately. We have just started to operate one new plant which will serve to alleviate some of this economic disadvantage. We believe that more new plants will be established wherever there is sufficient market incentive. There is no need for nationwide increase in capacity for cement. The present capacity of over 200,000,000 bbl. is far above the normal annual requirement for the United States."

One of the large Eastern manufacturers with a number of plants wrote, in part:

"Under present conditions, which are induced by the recent Supreme Court decision and extremely high freight rates, there is a decided tendency to shrink the normal marketing areas in the distribution of portland cement. This would naturally suggest the possibility of establishing new plants if and where raw materials are available, and there is some likelihood that this may happen to a limited degree. Building costs have reached such high levels, however, that the prospect of any extended expansion is rather remote.

"There seems to be no question but what enough cement production is available to adequately supply the needs of the country for many years to come, and while it is true that some of this production may be poorly located with relation to consuming areas, nevertheless the percentage of poorly located plants is not very high. There has been some moderate increase in capacity within the past few years and this increase will adequately take care of those few plants which have reached the point of obsolescence or, by reason of circumstances, may within the next few years be forced to suspend.

"There is at present before Congress a bill introduced by Senator O'Mahoney of Wyoming which would legalize freight absorption and allow business in general to shrink delivered prices in order to meet lower prices quoted by competitors. There is an excellent chance that this bill will be adopted, in which event the recent decision of the Supreme Court with respect to the Cement Institute case, the Rigid Steel Conduit case, and others of a similar nature will to a great extent be nullified. Of course this bill does not remove the penalties for collusion, illegal combinations, or similar violations of the Anti-Trust laws. However, no such violations were present in the Cement Institute case, the contention of the Federal Trade Commission to the contrary notwithstanding.

"If the O'Mahoney bill is approved, there is every indication of a return to competitive prices with reasonable freight absorptions. The staggering increases in freight rates, however, will have the effect of shrinking distribution area, but this in and of itself is not particularly serious from the standpoint of cement supply."

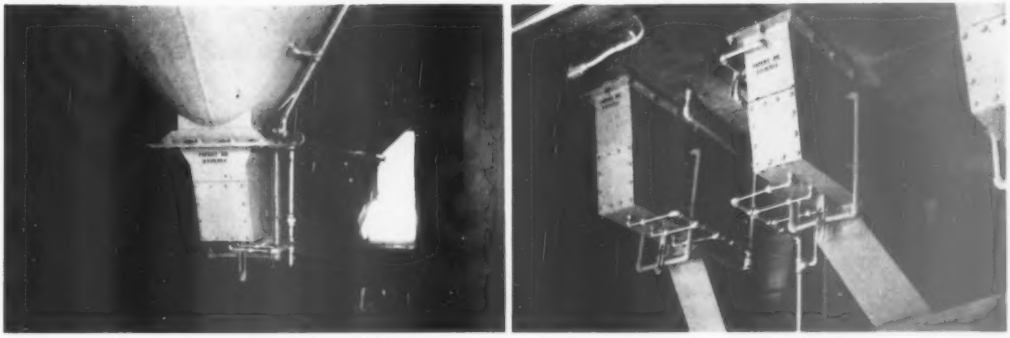
A Midwestern manufacturer commented at great length as follows:

"In our Annual Report for 1948 we made the observation that it is inconceivable that the threats against competitive delivered pricing can survive an understanding of their consequences. Today we have evidence that the consequences are beginning to be understood. There exists today pending legislation to clear up the confusion created by the Supreme Court opinion in the Cement Case. A significant development in that connection is that some of the most ardent exponents of the enforced uniform f.o.b. plant pricing crusade of the Federal Trade Commission seem to show a disposition to admit that there might have been major flaws in the Federal Trade Commission's economic theory bearing upon this matter.

"It is in the light of these developments that we address ourselves to your question, 'Do you think that new plants will be established and that there will be much decentralization of production as a result of the (cement case) decision and high freight rates?' First let us point out the fact, not generally appreciated, that the cement industry is already highly decentralized. This, itself, militates against any accelerated trend toward further decentralization. Beyond this, we believe that very little if any consideration has been given by the different companies in this industry to a re-arrangement of their production facilities for the sole purpose of integrating them with marketing restrictions supposed to have been imposed by the Federal Trade Commission and supposed to have been upheld by the Supreme Court in the Cement case. The reason, we think, is that the practical man, who has his own individual marketing problem to deal with, instinctively knew that enforced uniform

(Continued on page 139)

These 10- x 300-ft. wet-process kilns at Universal-Atlas Cement Co., Leeds, Ala., plant were being driven at 100 r.p.h. (see ROCK PRODUCTS, August, 1947, p. 134)



Airfeeder and airslide combination at Saginaw, Mich., plant, left, as used for feeding and conveying cement from each silo to a common screw. Right: Arrangement of airfeeders at Saginaw packing plant for delivery of cement to packing machines or into bulk-loading screw conveyor

Air-Activated Gravity Conveyors

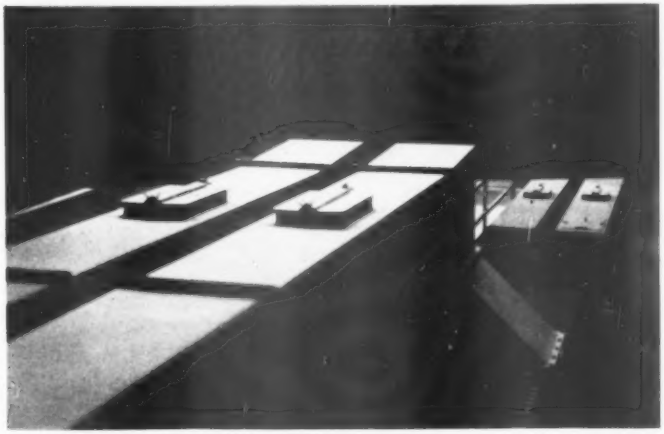
Huron Portland Cement Co. perfects process for non-mechanical transport of pulverized materials with many economic advantages

By BROR NORDBERG

THE ALPENA, Mich., plant of Huron Portland Cement Co., shown on the cover of this issue of ROCK PRODUCTS, is possibly the largest single portland cement plant now in operation. The plant attained this status during the past several years simultaneous with meeting the highest demands in its history for portland cement.

The plant is a dry process, waste-heat boiler operation, employing closed-circuit grinding in both raw and finish mills. Following World War I a "second mill" was built alongside the original plant and, in 1948, the clinker capacity was increased materially by installation of four new kilns to bring the total to eighteen. Grinding equipment has been augmented, as well, and improved methods of milling initiated to increase substantially the output of kiln feed material and finished cement. The big majority of the production is shipped in bulk by cargo steamer to ten company-owned distributing plants strategically located to serve Great Lakes markets.

The great growth in plant capacity under unusual handicaps is remarkable and worthy of a story in itself but, from the standpoint of potential contribution to the art of manufacturing portland cement, is over-shadowed by the company's development and extensive application of air-activated gravity conveyors and air-activated feeders in the handling of pulverized materials.

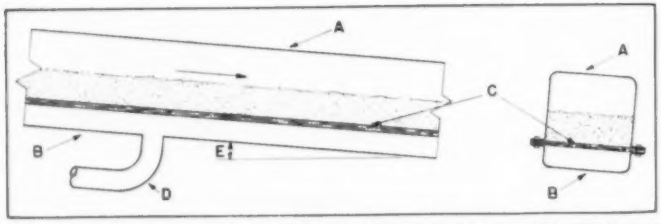


This illustration, of two 14-in. airslides conveying material to the kiln feed tanks, shows how obstructions may sometimes be by-passed

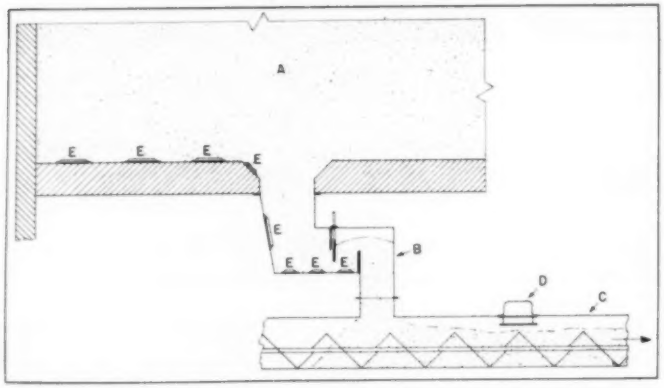
There have been previous attempts to employ low-pressure air as a medium to facilitate material movement in the cement industry and for blending in dry process plants, but the development work carried out at Alpena for several years has been entirely independent of earlier efforts and has resulted in the perfection of feeders and conveyors that have been proved practical and economic for many applications.

Having seen these feeders and conveyors in service at Alpena, in the transport of grinding mill discharge, mechanical air separation rejects, kiln feed materials, collector dust, finished cement and in the distribution of materials into bins and in withdrawal from bins, hoppers and steamship cargo holds, we believe that Huron has accomplished the greatest development in pulverized materials handling in many years.

These devices are far removed from the experimental stage. They are the result of combining experimental work with full-scale installations made while expanding the plant, and many units have been in service three years or more. Their contribution to increased production and to expediting



The airslide consists of an upper housing "A," and air duct "B," and a porous fabric "C" fastened between the two housings. Low pressure air is supplied into housing "B" through supply pipe "D." Material flows by gravity on the surface of the porous fabric "C" at an operating angle (E) from the horizontal



Fully automatic feeding and conveying arrangement. Typical flat-bottom silo "A" has an air-feeder "B" at one discharge opening, delivering material to screw conveyor "C." The feeder has four aerator units "E," and additional ones on the floor of the silo provide a continuous path of aerated material to the discharge opening and to the feeder. Diaphragm of the level control device "D" fitted in the screw conveyor cover is set to maintain the desired level in the screw conveyor box. A single air supply line, controlled by a solenoid valve, supplies all the aerator units. The level control device (D) switch is connected in series with the solenoid valve. When material in the screw box reaches the level of the diaphragm of the level control (D), the solenoid valve circuit is opened and air flow to the aerator units (E) is stopped. As the level in the screw box drops, the solenoid valve again opens and air is supplied the feeder. With the solenoid valve opening and closing regularly at about 30-second intervals, a constant level of material is maintained in the screw box

the distribution and loading out of cement has been considerable.

The principle of the Fuller-Huron "Airslide" and Fuller-Huron "Air-feeder" as the conveyor and feeder have been designated, respectively, and which have been licensed for manufacture to the Fuller Co., (exclusive of truck trailer applications) consists basically of changing the angle of repose of materials by their complete aeration and resulting transformation to a fluid state.

Development

Airfeeders and airslides are the result of experiment in an endeavor to take advantage of this long known property of fluidization in an attempt to attain regulation of feed of materials throughout the plant flow. The airfeeder which is illustrated herewith in actual operation consists essentially of an irregular duct through which material moves under one baffle and then over another baffle to reach the outlet. When aerated, the material will flow through the airfeeder and, when aeration is stopped, the obstruction to flow will halt the movement of material almost instantly.

The fact that material has some movement horizontally through an air-feeder (patented in 1944) led to further experiments which later resulted in development and perfection of the airslide. Use of aerating pads, at first, spaced at intervals over the length of a conveyor, disclosed that material could be conveyed at a high rate of speed by gravity if completely aerated. However, the action was sporadic and the next step was the development of a continuous porous fabric through which low-pressure air could be introduced uniformly over the entire length of a conveyor to permeate the material resting on the porous fabric.

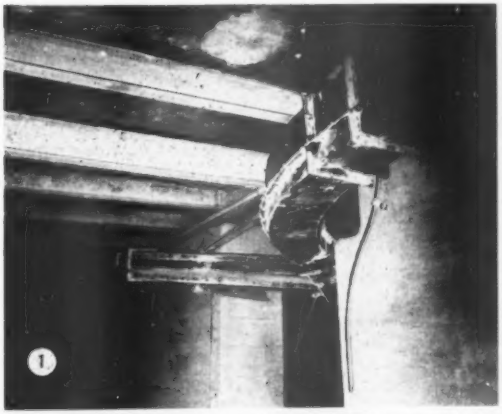
Design Factors

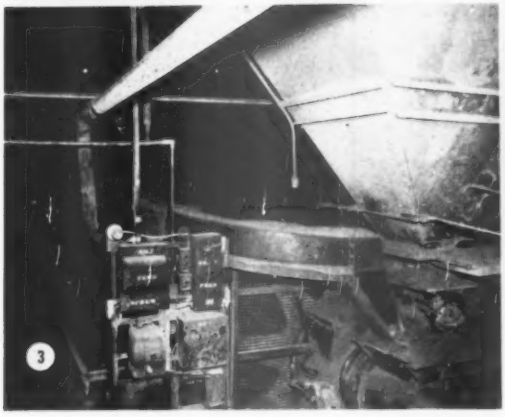
The design of the airslide takes into consideration a number of factors and special physical characteristics of the particular material to be conveyed, as determined for each application. Among them are the fineness and particle size gradation of the material, its angle of repose when aerated, air requirements for the optimum degree of aeration, and the maintenance of the permeability of the porous medium through which the air is introduced into the material.

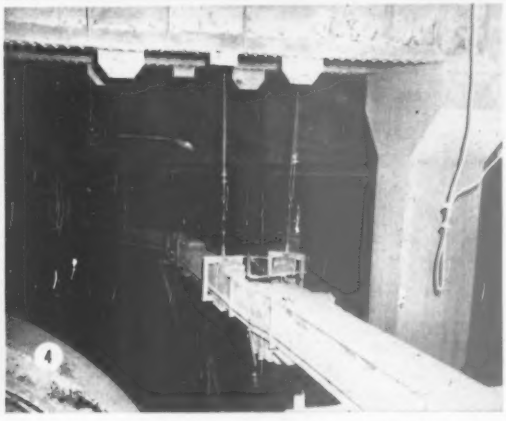
The porous medium used is a woven canvas fabric which has sufficient resistance to air flow that there will be no appreciable drop in static pressure throughout the length of a conveyor regardless of the location of the air duct through which air is admitted into the chamber below the canvas. Actually an airslide is of sheet metal, rectangular in vertical section, and of whatever length is required for a specific installation. The lower part of the conveyor is an air chamber separated from the material being moved by the canvas fabric over which the material supported by the fabric flows by gravity when aerated. The fabric is cemented in place and clamped so that the conveyor is dust-tight as used for handling materials in process. Air is admitted into the chamber through a duct from a blower, to fluidize the material uniformly and keep it moving downgrade.

Volume of air required is 3 to 5 c.f.m. per sq. ft. of fabric in a given conveyor and the angle of inclination required varies between 4 and 6.5 deg. from the horizontal, dependent upon the material involved. Standard portland cement, with a normal angle of repose of 50 deg., and pulverized raw materials ready for kiln feed are transported by conveyors at a 4 deg.

Two hoppers under a screen-type dust collector in the finish grind. The material collected in these hoppers was so fine and sticky that the hoppers would not clear themselves even at the steep angle shown. The sloping sides of these hoppers were fitted with airslides to solve the difficulty







No. 1: Two airslides conveying mill discharge from raw compartment mills to bucket elevators delivering material to air separators. This illustration shows upper end of airslides as they turn a 90 deg. corner around the mill foundations. No. 2: Airslide in the finish grind conveying finished cement. The "S" shape used here illustrates the ease with which obstructions can be avoided in congested areas. No. 3: Discharge end of airslide in finish grinding department returning tailings to compartment mill. No. 4: A main airslide with two branches conveying tailings from a 16-ft. air separator serving two compartment mills in the finish grind. The stream of material is divided by a vane-type splitter

angle whereas high early strength portland cement, air separator rejects and mortar cements require a slope of 6 or $6\frac{1}{2}$ deg.

Velocities range from 800 to 1200 f.p.m. in carrying beds of material ranging in thickness from 1 to 6 in. Capacities are closely proportional to widths of airslides and sizes in use at Alpena, range in width from 6 to 14 in. Largest tonnage transported thus far has been 225 t.p.h. of kiln feed material as conveyed by a 14-in. airslide, 180 ft. long, in delivery to the kiln feed tanks. However, the conveyor in this case was not loaded to capacity and, for that matter, the ultimate capacities of airslides have not been determined.

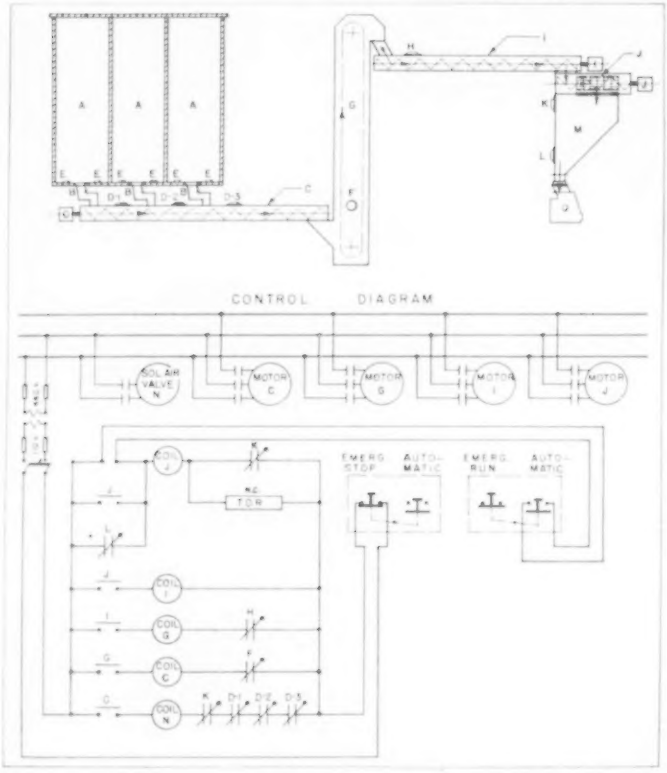
Use of this airslide for feed to an air separator saved headroom and reduced height of elevator

Experimental Conveyor

Before discussing specific applications of airslides, we emphasize that each installation must be designed to fit its application. For the purpose of determining design an experimental airslide 92 ft. long and 8 in. wide has been built for test purposes in one of the mill buildings. It has an adjustable slope between horizontal and 8 deg., a feed bin and collecting bin. In excess of 1000 bbl. per hr. of standard portland cement has been conveyed by this unit when set at a 4 deg. slope.

Wide Application

At the time we visited the Alpena plant early in June, there were 8773 ft. of airslides in service of which some 4000 ft. were installed in that plant and the balance in the various distribution plants. A total of more than 40,000 tons of material a day were being conveyed by airslides at Alpena alone. There were 447 airfeeders in operation, most of them at the distribution plants. The reason we mention the dates is that the plant has an airslide and airfeeder fabricating department and is constantly building new units for replacement of other conveyor equipment in the plant that has not yet been replaced. Also, as yet untried applications are to be attempted since possible uses of this equipment in the manufacture of ce-



Layout and control diagram as installed at Detroit and certain other distributing plants for automatic feeding and conveying of cement. Packing machine "O" is supplied from tank "M" which is fitted with level control devices "K" and "L." When the level in tank "M" drops below "L," the entire conveying and feeding system is automatically put into operation in the following sequence: (1) Screen "J" is started; (2) Distribution conveyor "I" is started; elevator "G" is started; tunnel conveyor "C" is started; solenoid air valve "N" is energized, providing air to one airfeeder "B" and aerator units "E" and material feeds from one of the silos "A." A particular air feeder is selected either manually or by remote control. While supply tank "M" is filling, level control devices "D-1," "D-2," "D-3," in series with solenoid air valve "N," regulate the flow of air to the airfeeder. Level control device "F" is connected in series with the stop circuit of the tunnel screw magnetic starter, serving as a protective device to shut off tunnel screw "C" and the feed in event of elevator overload. Level control device "H" is in series with the stop circuit of the elevator magnetic starter and prevents plugging of the elevator and tunnel screw in case of mechanical failure of distribution screw "I." The entire system is electrically interlocked to prevent plugging due to electrical failure on any unit. When level of the material in tank "M" reaches "K," the solenoid valve is immediately de-energized and feed is stopped. A time-delay relay allows the conveyors, elevator and screen to operate until the system is cleared; then the entire system shuts down. The cycle repeats as level "L" is again reached

ment have by no means been exhausted.

It was amazing to watch the airslides in operation because there was no noise, no dust and no visible evidence of materials being conveyed except when watching through removable inspection covers where the materials could be seen flowing by at high rates of speed. Actually, the rate of flow is in the 12 miles per hr. range.

Raw Mill

Several airslides have seen over three years of service without replacement of any of the component parts. In the early stages, some wear was observed on the fabric where the load was allowed to drop on it from an elevation, but that practice has been eliminated. Over 1050 ft. of screw conveyors have been replaced in this department alone where airslides perform four distinct functions. There are nine 7- x 26-ft. Compeb mills arranged in a row, each fed by a Hardinge Feedometer and in closed circuit with a 14-ft. Sturtevant mechanical air separator. Each mill is vented by an American Wheelabrator bag-type dust collector and grinds as much as 26 to 27 t.p.h. to a fineness of 91 percent minus 200-mesh in conventional circuit with its air separator.

Airslides vary in width according to the tonnage they handle. Mill discharge is carried to the bucket elevator serving the air separator by an airslide which has a semi-circular curvature to return the material counterflow to the direction of mill flow back to the elevator. In cases like this or when other obstructions are encountered, the airslides are built to whatever curvature is needed to either go around the obstacle or send the materials in whatever direction is required. No transfer unit is needed. If a horizontal obstruction exists, the airslide is just "stepped down" to go under it as shown in one of the illustrations.

Rejects from the separator are returned by an airslide to feed into the grinding mill at a point alongside the fresh material feeder. Dust from the collector is transferred by an airslide into the one conveying raw mill discharge to the bucket elevator which delivers into the air separator via another airslide overhead. Lastly, finished raw material is conveyed by airslides extending under the discharge points of all nine air separators and delivering to an enclosed bucket elevator for elevation and then transfer into the individual kiln feed tanks. There are two of these long parallel airslides, stepped up progressively in width from 8 to 14 in. as the load increases in accumulating the discharges from successive air separators.

Use of airslides in the raw mill contributed materially to the increase in production required as demands upon the plant increased. Eight of the nine mills had been operated in closed circuit with air separators, using 12-in. conventional screw conveyors to complete the grinding circuit. All these conveyors were displaced. The single

The airfeeder-type of splitter. The small surge bin is shown at the top, with the two airfeeder controls discharging to the left and right underneath the surge bin. The discharge from each side is returned to the compartment mills by two airslides

new mill was equipped to operate with airslides from the beginning.

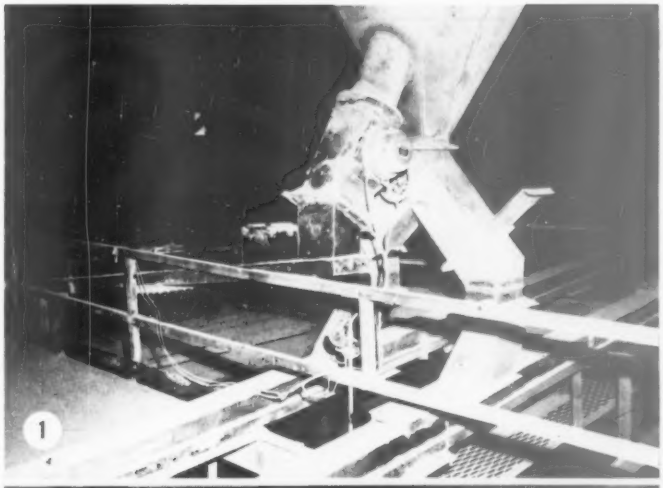
It was desirable to increase the circulating loads in each mill circuit in order to step up production and the existing screw conveyors could not handle the circulating load required, as other changes in milling practice were adopted. One step in increasing output was to install vibrating screens to screen out minus $\frac{1}{2}$-in. raw material ahead of the hammermills. At the separating heads within the Compeb mills the grids were "opened up" to $\frac{1}{4}$ to 3/16-in. slots so that the mills are operated as modified tube mills in circuit with the air separators. Whereas 50 percent was the customary circulating load, the figure has been stepped up to around 200 percent which necessitated much higher conveying capacities.

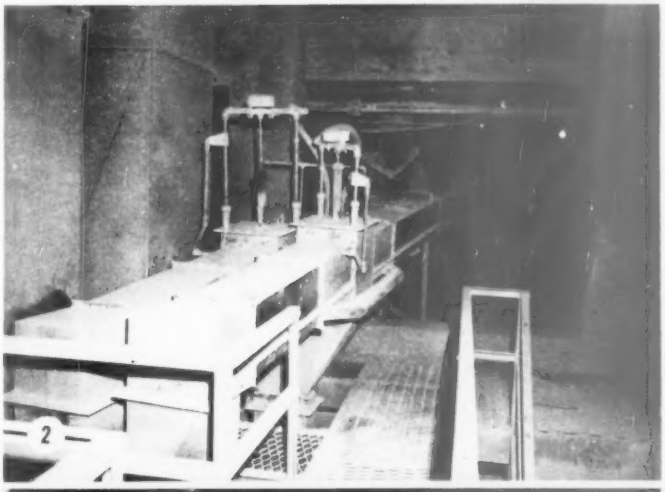
A change was needed at the point of discharge of the mill stream into the bucket elevator in each case since, by conventional practice, the fluidized material would flu.T out of the buckets. This was solved, and to advantage, by building up the sides of the buckets so that their capacity was increased some 40 percent. Points of discharge into the elevator was changed so that the material enters the boot of the elevator direct and the elevator now actually dredges material out of its bottom.

Whereas 200 hp. in connected motor drives was required for operation of the screw conveyors in eight original mill circuits, the connected horsepower is now eight 2-hp. motors driving simple paddle-type fans, one to each circuit. A duct is run to each of the airslides in a circuit from the single fan. Whereas, in many applications, ducts might be run from an air manifold it was of interest to us that in some places an additional airslide is supplied air by merely running another duct direct from the air chamber of an airslide already in service. This is mentioned as just one example of the great flexibility of this device.

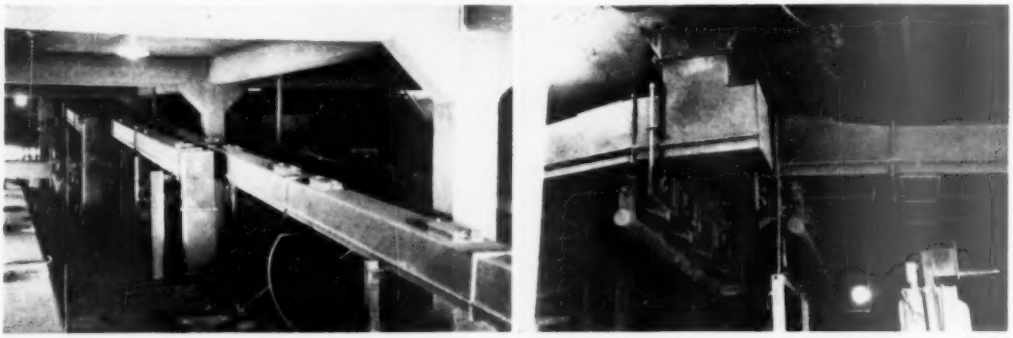
Kiln Feed Material

Finished kiln feed material is elevated overhead where two parallel





No. 1: Bottom of air separator in raw grind. At left is airslide returning tailings to the mill. Fines discharge through two-way spout into either of two airslides shown near bottom of illustration. These two collecting airslides are approximately 200 ft. long and convey the output of nine raw mills to bucket elevators. Note level control devices which are a protection against overloading the conveyors. No. 2: Two airslides carrying fines from raw mill at the point of discharge. Either airslide can discharge into either of two bucket elevators. Each is fitted with a bottom-discharge gate. In the illustration one of these gates is in open position and the other is in closed position. No. 3: Two 14-in. airslides, each with a capacity of 225 t.p.h., conveying raw mix over kiln feed tanks. The illustration shows side-discharge gates. These gates intercept and discharge part of the stream of material through the spout shown at left, into the kiln feed tank; the balance of the material moving on to the remainder of the kiln feed tanks



Left: Discharge ends of airslides (14 total) for distributing cement into vessel-loading bins. Right: Underside of surge bin (illustrated also by accompanying drawing). Fourteen airfeeders discharge into 14 airslides to provide distribution of 3000 bbl. of cement per hr. into 14 vessel loading bins. Airfeeder gates are connected by linkage to butterfly valves in the air supply line. Control of distribution, therefore, consists in merely opening or closing the desired airfeeder gate

14-in. airslides deliver the stream into the separate kiln feed tanks serving each of the 18 rotary kilns. These airslides carry 225 t.p.h. of material each and all that is required for operation of each one is a single 5-hp. motor driving the fan supplying the air. Side-discharge valves, which are discussed later divert the raw material to the respective kiln feed tanks.

Finish Mill

Until the need arose for great increase in the capacity for grinding clinker into portland cement, eight of 12 No. 724 Compeb mills were operated in closed circuit as preliminary mills, and four mills in open circuit as finishing mills.

Clinker was first crushed to ½-in. top size. Now, the type R Allis-Chalmers clinker crushers have been opened up for a top product size of ¾ in. Six Hercules mills grind the clinker to 700 cm2 per gram at the rate of 200 bbl. per hr. each and there are 12 finish mills. Eight are in closed circuit with 14-ft. mechanical air separators (8) and each of two 16-ft. air separators is in closed circuit with a pair of mills. Individual dust collectors serve these circuits, as in the raw mill, similar feeders are used and almost identical high circulating loads are carried. Use of airslides is similar to that in the raw mill except that there are special provisions for dividing the stream of rejects from the 16-ft. air separator to the two mills in circuit with each. Thirty-five airslides transfer the Bradley mill product to the finish mill feed bins. The finished product is elevated and distributed into the cement silos overhead by screw conveyors, which are scheduled for replacement with airslides.

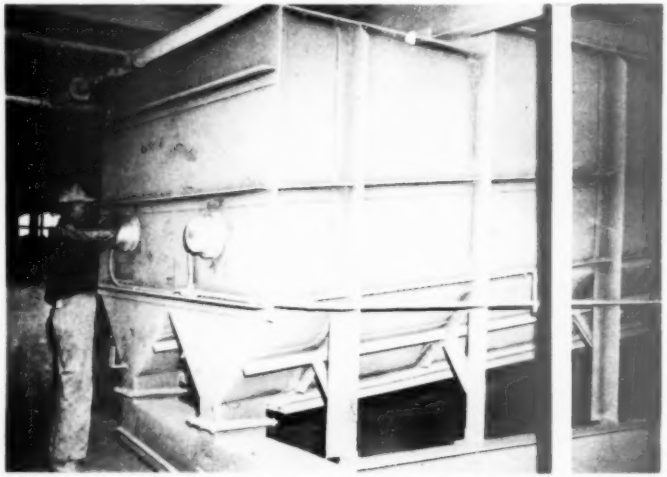
Open and Closed Types

There are airslides of different designs for different purposes. Those intended to transport a thin, uniform bed of material and which are supplied a controlled feed like the installations discussed are fitted with dust-tight covers and are supplied air at 4 to 12 in. (w.g.) Where airslides are located in bins, hoppers or vehicles and where they are subjected to a constant head of material and feed control is not a factor, they have no covers and are supplied air at pressures from 12 to 20 oz. These airslides have been operated successfully under heads as great as 80 ft. in silo applications. Under extreme conditions such as this, the porous medium is sometimes supported additionally by wire mesh reinforcing.

Automatic Controls

In operation of the enclosed airslide as used in the raw and finish grinding departments, the angle of inclination must slightly exceed the angle of repose of the aerated material. Rate of feed is obviously important for, if the material should completely fill the upper housing, de-aeration would result and the flow of material will stop temporarily unless higher pressure air is used. There are safeguards provided in event of that possibility. An example of such an automatic control device is illustrated in connection with air separators in the raw mill. There are Bin-Dicators in the reject spout and the cement spout above the point of entry into the two airslides. Should material flow be too great and contact be made with the Bin-Dicator diaphragm, the mill drive clutch will throw out to cut the mill until conditions clear. Devices such as this and others in use prove the airslide to be admirably suited to automatic and controlled operation.

Among the accessories in use are Bin-Dicators, gates and various valves which adapt the conveyors to automatic operation and to serve various special functions. A side discharge



A 200-bbl. cement storage bin 20 ft. long, fitted between two floors of an existing building. Material rests directly on fabric of airslides. The two airslides forming the bottom of this bin discharge into another airslide feeding scale hoppers for weighing and loading bulk cement

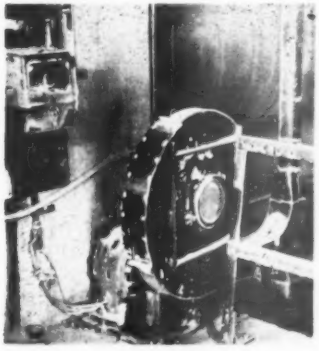
gate is sometimes used where intermediate discharge is required from an airslide, to divert part of a stream of material to a bin or tank while allowing the balance of the stream to continue on to other discharge outlets. A vertical, pivoted and adjustable vane pointed upstream is the deflector. This method is used in distributing kiln feed material from the 180-ft. airslide into the respective kiln feed tanks serving the 18 kilns. The gates are power-actuated and, by the use of Bin-Dicators on the feed tanks, the gates can be operated automatically in response to fluctuating levels in the kiln feed tanks. A plug-type gate, in which the plug is a short section of the airslide conveyor, opened pneumatically to lift vertically, is used for bottom discharge application.

To split a stream of material from one main airslide into two branch units, a vane-type splitter is used, the vane being pivoted at the point where the branches start, with the edge pointing downstream. This vane may be positioned to proportion the respective flows to the branch conveyors.

An airfeeder type of splitter is preferred where more accurate control is necessary in proportioning flow to two branch conveyors, to spouts or into bins. One such application is in splitting the tailings from a single 16-ft. air separator in the finish mill to divide for return into two Compeb mills. In this application, the main conveyor discharges into a small surge box from which two airfeeders at right angles control the proportions entering into the two branch airslides. Adjustment of the movable gates in the airfeeders themselves is the means of changing the amount fed out in each direction.

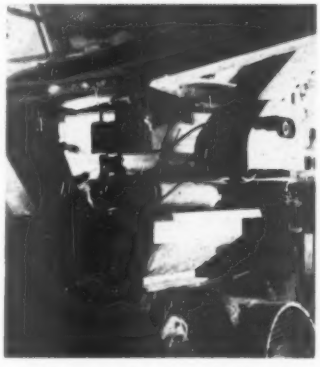
Other Applications

As stated earlier, all the possible applications of these conveyors and feeders in the handling of cement materials, to say nothing of uses in other industries, have by no means been tried. Experiment is now under way



This small blower supplies all the air for conveyors in connection with a complete grinding circuit

Series of short airslides with one main collecting airslide, conveying cement from elevated concrete bins to a shuttle screw conveyor for loading vessels. Airfeeder controls are fitted at the point of discharge from the bins. This conveyor delivers 1500 bbl. per hr.



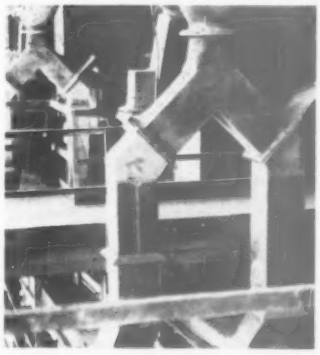
Showing how grinding mill rejects are fed into mills alongside fresh feed material

at Alpena in the use of these conveyors for regulation of kiln feed. All distribution into cement silos will be by these conveyors. At present, airfeeders and airslides are used to withdraw cement from ship-loading bins for transfer to a main airslide which, in turn, delivers into an extendable screw conveyor to load directly into cargo ships. The extendable screw conveyors, of which there are seven, will be replaced by airslides.

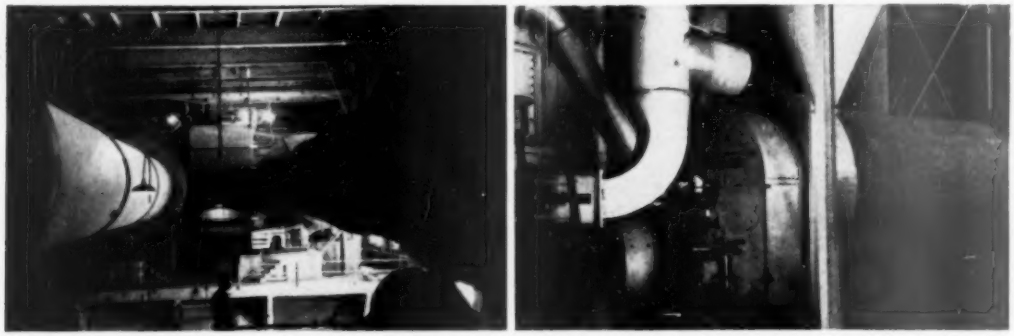
An interesting very recent application of the new conveying principle is in the distribution of cement into the ship-loading bins alongside the waterway. There are seven pairs of bins with 30,000 bbl. total capacity arranged in a row. A surge bin of 150-bbl. capacity was erected on the roof over the bins at the mid-point. Three 10-in. Fuller-Kinyon pumps deliver cement into this bin, which is hoppered as shown in one of the accompanying illustrations,so that seven parallel airslides may be fed cement on each side. The material in the hoppered bin rests on the fabric of an open-top airslide forming the bottom of the hopper and, when aerated, flows into one or more of the branch conveyors to fill a particular bin or several simultaneously. Each airslide goes to a designated bin. A Roots-Connersville positive pressure blower, driven by a 15-hp. motor, supplies the air to a manifold from which ducts lead to the respective airslides. The bin will completely empty when only one branch airslide is operative which emphasizes its versatility should it be desirable to change types of cement and yet avoid contamination. Delivery of cement into the boat-loading bins has been increased from 2000 bbl. up to 5000 bbl. per hr. by this installation.

Distribution Plants

In a typical installation of an airfeeder as shown in operation at the Saginaw, Mich., packing plant, where it is desired to withdraw material



In raw mill, two airslides receive the output of all air separators. Note reject airslides going off to right



Two of the newer rotary kilns, left. In background, top, kiln feed material is delivered by airslides to all of kiln feed tanks. Right: One of 18 rotary kilns in Huron plant

from a bin, the airfeeder consists of a housing with a fixed upper baffle, a movable gate and a fixed lower weir. The gate is controllable by rods projecting through the top of the housing through dust-tight fittings. Air is supplied by Bin-Flo aerator units in the feeder housing and through aerator units inside the bin. These aerator units, fed air through an air line, are small, flat trays measuring $3\frac{3}{4}$ x $7\frac{1}{2}$ by $\frac{1}{2}$ in. thick and are covered by a high permeability fabric diffuser. In operating the airfeeder, the movable gate is adjusted to provide an opening dependent upon the desired rate of flow and compressed air is introduced to the aerators at 2 to 4 p.s.i.

At Saginaw, which is typical of all the distributing plants, except that it is one of the smallest, there are facilities for bagging cement or for loading out in bulk to trucks. There are five silos of 8200 bbl. capacity each and two 2500 bbl. interstice bins for storage, which are filled by Fuller-Kinyon pumps from cargo ships loaded cement at Alpena. Three silos are arranged in a row and a parallel row on the opposite side of a main 12-in. screw conveyor at floor level consists of the other two silos and a shipping silo. There are two 4-spout St. Regis packing machines.

All the silos have conical steel bottoms and the interstice bins discharge directly into the main 12-in. screw conveyor, which delivers to an enclosed bucket elevator for transfer to the overhead shipping silo.

Each of the five main silos has an airfeeder of the type mentioned delivering to a 10-in. airslide which in turn delivers to the common screw conveyor. Two Bin-Flo aerating units, on just one side of the conical hopper above the feeder, and the airfeeder are supplied air from the main plant compressor through a pressure reducing valve. A simple blower is to be installed for the purpose. Operating air pressure is 4 p.s.i. These silos clear themselves completely without any plug-ups.

Bin-Dicators mounted on top of the main screw housing opposite each silo automatically cut the air supply to the airfeeder, bin aeration units and airslide when the level in the screw conveyor reaches capacity, and the air valves automatically re-open when the level drops slightly, so that the screw conveyor is carrying maximum capacity all the time. The Bin-Dicators are in series with a solenoid valve so that when the Bin-Dicator diaphragm is raised, the solenoid valve closes the air valve.

A remote-control selector delivers cement into either of the four compartments of the shipping bin. It consists of a motor-driven worm gear turning the center shaft of a turnhead funnel through which the cement flows. High and low Bin-Dicators set off a whistle on the operator's floor when a bin compartment approaches empty or full.

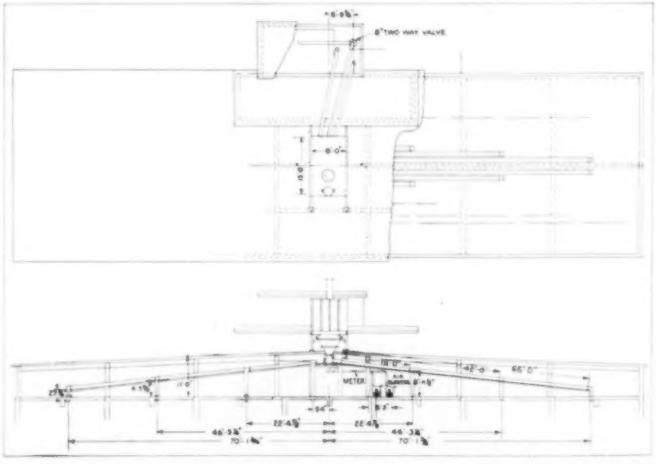
Eight airfeeders, two to each bin compartment, are the means of withdrawal of cement from this overhead bin, one of each pair delivering to a screw conveyor for bulk loading and the other into a packing machine supply bin. The packing machine bins also have high and low Bin-Dicators.

This plant has 15 airfeeders and 5 airslides which will be supplied air by a blower driven from a 10-hp. motor but consuming somewhat less power. They replace 12-in. lateral screw conveyors with rotary feeders and deliver 25 percent more cement per hr. A 100-bbl. bulk cement truck can be loaded in ten minutes.

Unloading a Steamer

To see how airslides are used to unload cement from a steamship is the most intriguing of all. The S. S. Samuel Mitchell, one of the three cement steamships operated by Huron Transportation Co., a subsidiary company, has been converted and short lateral airslides have replaced an extensive system of screw conveyors.

A false floor consisting of small parallel hoppers was built and the hoppers sloped at the correct inclina-



Arrangement of airslides to distribute cement from overhead 150-bbl. surge bin into ship-loading bins

tion for airslide operation toward a tunnel at the longitudinal centerline of the ship. The airslides are on 2-ft. centers, side by side for the entire length of the cargo hold, and utilize air at 12 to 20 oz. pressure supplied a 5 c.f.m. per sq. ft. of surface by two Roots-Connersville blowers powered by 15-hp. motors.

Each airslide is supplied through an individual airline connected to a manifold in the tunnel. Air to the manifold is controlled by a solenoid valve which is in series with Bin-Dicators spaced on top of the tunnel screw conveyor box at 12-ft. intervals for the entire length of the tunnel. The airslides discharge through separate 4- x 8-in. openings in the tunnel wall into the screw conveyors (2) and small slide gates are the means of opening and closing the separate openings.

The screw conveyors deliver, at the bow end of the ship, to elevators and the cement is transferred into a Fuller-Kinyon cement pump feed bin by two airslides and is then pumped out of the ship.

In starting to unload cement, the operator first opens several slide gates and then the air cocks. When the air is applied, the cement flows into the screw conveyors, filling the screw boxes to a level 5-in. from the top of the box as regulated by the Bin-Dicators. When the diaphragm of the Bin-Dicator is raised, the solenoid valve controlling the air manifold is closed, and then automatically reopened as the level of the cement drops.

The operator observes the level of the cement in the Fuller-Kinyon feed bin. If all three lights are on as actuated by Bin-Dicators, he reduces the rate of feed to the pump by simply slowing the speed of the tunnel screw conveyors through remote controls on their variable speed drives. Conversely, he increases the speed of delivery. Cement is delivered to a 10-in. pump at the rate of 1350 bbl. per hr. Through elimination of the need for steeply inclined hoppers and lowering of the center of gravity of the cargo, the carrying capacity of the S. S. Samuel Mitchell has been increased from 12,500 to 18,000 bbl.

This vessel is fitted with airslides, as shown in the accompanying cross-section sketch. It is one of three vessels serving Great Lakes ports

Truck Delivery

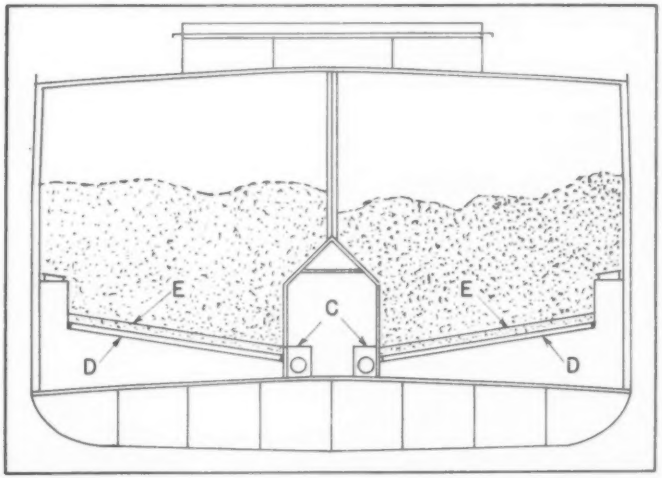
Gramm Trailer Corp., has been licensed by Huron Portland Cement Co. to manufacture bulk cement carriers utilizing air activation in the transport and delivery of portland cement, lime, chemicals and other materials to which the principle is adapted, and there are more than three years successful experience in this application. It is said that a 125-bbl. truckload of cement can be unloaded in six minutes.

Advantages Summarized

Experience has been favorable from every standpoint and many advantages have been proved for these conveyors and feeders. Power consumption is extremely low and actually is only ten percent the requirements for the conveyors formerly in use. Thus far, the saving in power used at Alpena is about 1000 hp. and will probably be twice as much when the entire plant is converted.

Air volumes required are so small that extra facilities for venting bins or silos often have not been necessary. In some cases, venting and dust collection are desirable. Capacities are high and operations are dustless and noiseless. There are many advantages involving head room and circumventing obstructions in a plant. As an example, the use of an airslide to convey material into an air separator, because of its low angle of incline, has made it possible to reduce elevation heights where use of a conventional spout would have necessitated extending elevators through the roof of a mill building. The ease with which changes in direction are accomplished has proved invaluable through the use of curved sections. Airslides are easily erected, requiring only simple supports and maintenance has been extremely low. Should replacement be needed, the company has standardized on 10-ft. sections of the various widths which are fabricated in advance and kept in stock. A replacement section can be bolted in place in 30 minutes. Replacement blowers are also kept in stock. There being no moving parts, lubrication is not required. Simplicity, safety and automatic features are other benefits.

As manufactured under license by



Midship section of the S. S. Samuel Mitchell. A false floor of small parallel hoppers was built with the hoppers (E) sloped as shown to correct conveying angle. Airslides (D) were installed on 2-ft. centers to discharge through openings in the tunnel wall into screw conveyors (C). The screw conveyors deliver to elevators from which airslides convey the cement into a bin over a cement pump

Loading limestone into trucks of 22-ton capacity for the haul to the crushing plant

the Fuller Co., these conveyors will be adapted to many applications in other industries. Limitations in top size of materials that may be so conveyed have not been determined but it is likely that materials containing particles as large as ¼ in. can be handled provided there is sufficient fines in the 100-mesh, 200-mesh size range to provide the necessary fluidity when subjected to air under low pressure.

Plant Expansion

Huron Portland Cement Co., with principal offices in Detroit, Mich., has ten distributing plants to which portland cement is shipped by water to serve the Great Lakes area. These plants are located at Detroit, Mich.; Cleveland, Ohio; Duluth, Minn.; Milwaukee, Wis.; Buffalo, N. Y.; Toledo, Ohio; Saginaw, Mich.; Oswego N. Y.; Muskegon, Mich.; and Green Bay, Wis. Deliveries are made to these plants by the S. T. Crapo, S. S. John W. Boardman, and S. S. Samuel Mitchell, operated by the Huron Transportation Co. Upper Michigan customers are served by rail and truck but over 90 percent of all shipments made out of Alpena are by bulk in steamships.

Since all shipping by water must be done during the April 1-November 30 navigation season, the plant at Alpena must be operated the year around and carries enormous storage of materials. Storage facilities will accommodate 750,000 bbl. of finished cement and 1,000,000 bbl. of clinker.

Originally, the plant had eight 8- x 110-ft. rotary kilns but now has in operation eighteen kilns, ten of which measure 10- x 153-ft. Four of the latter, two Allis-Chalmers and two Vulcan, were added and went into production in 1948. The ten larger kilns are direct-fired by Raymond bowl mills while the others are fired from a central coal drying and pulverizing system. A number of the kilns have Fuller inclined-grate clinker coolers and the balance are in process of conversion.

This has always been a waste heat plant and is one of very few in the industry that has continued self-sufficient in its ability to generate its power requirements. Individual 1000-hp. Wickes boilers with economizers, and Cottrell electrical precipitators were installed to receive the exit gases from each of the four new kilns a, the time of installation. Kiln exit gases are 1600 deg. F. upon entry to the waste heat boilers, 600 deg. F. upon discharge and the economizers are effective in reducing the temperature an additional 200 deg. F. to exhaust at 400 deg. F. Current kiln output is 17,000 bbl. per day and clinker grinding capacity is in excess of 24,000 bbl. daily throughout the year.

Stone

Limestone for the manufacture of portland cement is purchased from the adjoining quarry of Wyandotte Chemicals Corp. which operates a 230 acre quarry in a ledge of limestone exceeding 90 percent calcium carbonate. Fifty percent of the quarry production, of minus 3-in. stone, is available for cement manufacture via belt conveyor and the balance (plus 3 in.) is shipped to Wyandotte's chemical operations.

The stone has blocky characteristics and is crushed by two 60- x 84-in. Fairmount single-roll type crushers before delivery out of the quarry by two balanced 15-ton skip buckets to the screening plant.

Capacity of the quarry has been increased much by conversion to truck haulage in place of a third-rail system which became ineffective as the area under development reached out to great distance from the control tower.

Excavating equipment includes one 6-cu. yd. P&H series 1600 and two 5-cu. yd. Marion electric shovels, and haulage equipment includes 13 rear-dump Euclids. The trucks haul 22 tons per trip and are powered by 240-hp. Buda diesel engines. Average round trip—in a circle—is 1.75 miles and the maximum grade negotiated is 4 percent. The same trucks handle stripping during the winter months. Shale is obtained from the company's quarry at Paxton, Mich., which is 11 miles distant.

Personnel

Officers of Huron Portland Cement Co. are Emory M. Ford, president and treasurer; Frederick S. Ford, vice-president; Paul H. Townsend, vice-president and general manager; H. Ripley Schemm, vice-president in charge of operations; Clarence L. Laude, vice-president in charge of sales, and William W. Crapo, secretary and assistant treasurer.

Clinton P. Harris is mill manager; H. A. Browne, chief engineer; William G. MacDonald, mill superintendent; and Albert C. Fowler is chief chemist.

Quarry at Alpena is in blocky limestone and is one of largest capacity operations in the United States

Experience With Oxygen Analyzer

Missouri Portland Cement Co., St. Louis, Mo., has had excellent results in the attainment of fuel economy and uniform firing conditions through proper application of continuous gas analysis

By EARL H. GRAY*

TODAY'S HIGH COST of fuel has made it more important than ever to burn this fuel with the greatest possible efficiency. The cement industry has long recognized the value of waste gas analysis in securing a high fuel efficiency. Many plants run periodic Orsat analyses of their stack gases and use this data to adjust their burning conditions. However, this type of analysis cannot keep up with the changing conditions in a cement kiln; a continuous record of the stack gas analysis is required for the most efficient operation. This continuous record can be obtained by means of one of the many excellent oxygen analyzers which are on the market today. The data obtained from a properly installed and serviced oxygen analyzer will not only enable the kiln operator to burn his kiln at the highest possible fuel efficiency, but will also help him to maintain a more uniformly operating kiln.

Preliminary Study

In the spring of 1947, the Missouri Portland Cement Co., St. Louis, Mo., began an investigation on the use of oxygen analyzers as an aid to kiln operation. Three different types of oxygen analyzers were obtained and installed at this company's St. Louis plant. This plant has one 11 ft. 3-in. x 10- x 311-ft. kiln and four 11-ft. 3-in. x 10- x 240-ft. kilns, all with bin-system coal firing. By January, 1948, all five of these kilns were being operated with the aid of oxygen analyzers.

*Formerly Research Chemist of Missouri Portland Cement Co., St. Louis, Mo.; present address, Phillips Petroleum Co., Bartlesville, Okla.

A preliminary study, using the Orsat apparatus, demonstrated that the kiln operators, if left to their own initiative, would burn the kilns under reducing conditions. In order to see if the use of data from a continuous oxygen analyzer could correct this tendency, an oxygen analyzer was installed with two recorders, one at the rear of the kiln and one on the burner floor. Two 24-hr. tests were run, one with both recorders hooked up and the other with only the recorder at the rear hooked up. The results of these tests are shown in Fig. 1. It can be seen that more efficient burning conditions resulted when the kiln operator had the data from the oxygen analyzer. This test was carried out without the kiln operator knowing that he was being checked on and before he had any experience in burning with the aid of the oxygen analyzer.

Results obtained by use of the oxygen analyzers can be represented as the percent of the time that a kiln is burned under oxidizing conditions. Fig. 2 is a plot of this percentage and coal consumption for the year 1948. It can be seen that as the operators became more proficient in the use of the analyzers and increased the time that their kilns were oxidizing, the coal consumption dropped off sharply. The saving in coal that results from the use of oxygen analyzers can be seen by comparing the coal consumption for the years 1947 and 1948. During both of these years the kilns were being pushed to their maximum production. Oxygen analyzers were in use on the kilns during all of 1948 and only a small part of the time during 1947. The coal consumption for 1947 was 136 lb. per bbl. and for 1948 was 130 lb. per bbl. It can be seen from Fig. 2 that full benefit was not realized from the oxygen analyzers in 1948; therefore it is expected that in 1949 an even lower coal consumption will be realized.

Benefits Derived from Use of an Analyzer

A lower coal consumption is not the only benefit which results from the use of oxygen analyzers. Less "raw" clinker is produced, and in general the kiln operations are much more uniform. The older kiln operators, who were at first a little reluctant to use the oxygen analyzers, have accepted them and now would not want to operate a kiln without them. However, the data from the oxygen analyzers have helped the new operators even more. A man who does not have the benefit of many years of kiln operating experience is able to profit greatly by having the data from an oxygen analyzer to use in adjusting one of the kiln operating variables.

At this plant the kilns were normally burned with a deficiency of air, and combustible materials were present in the exit gases. A lower coal consumption resulted when a small amount of oxygen was maintained in the exit gases because these combustible materials, which heretofore had been wasted, were then burned. However, oxygen analyzers can also be

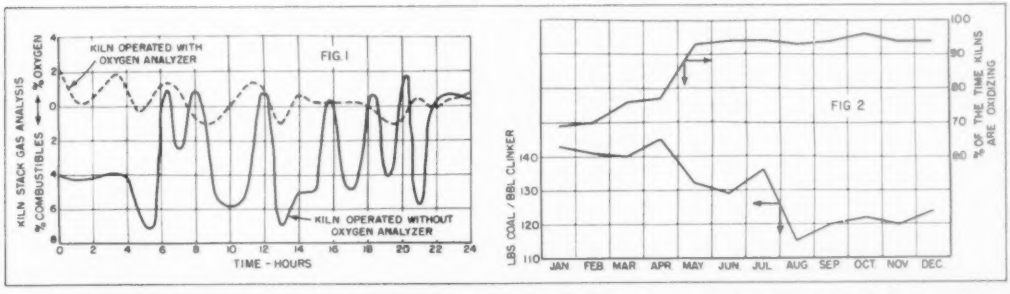


FIG. 1
KILN OPERATED WITH OXYGEN ANALYZER
KILN OPERATED WITHOUT OXYGEN ANALYZER
KILN STACK GAS ANALYSIS
% OXYGEN
% COMBUSTIBLES
TIME - HOURS
FIG 2
LBS COAL / BBL CLINKER
% OF THE TIME KILNS ARE OXIDIZING
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Fig. 1 (left): Graph of analysis of stack gases of a kiln operated both with and without an oxygen analyzer. Fig. 2 (right): Chart of oxidizing conditions and coal consumption for the year 1948, showing that as the operators became more proficient in the use of the analyzers and increased the time that the kiln was oxidizing, the coal consumption dropped off sharply

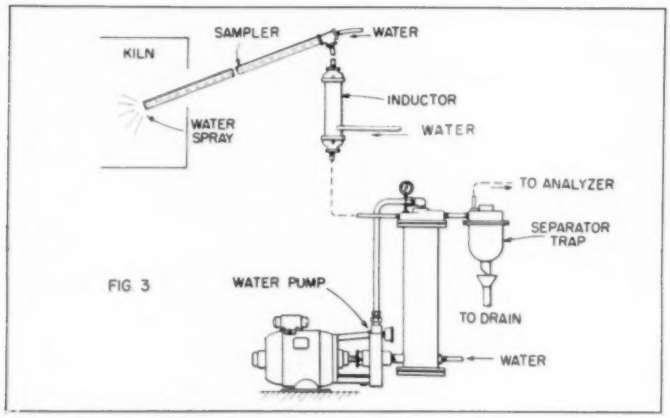


Fig. 3: Schematic diagram of sampler system. Water spray, upper left, removes dust from gas sample and also acts as a coolant

used to advantage on kilns which normally are fired with an excess of air. If too large an excess of air is carried, heat is lost as sensible heat of the stack gases. This heat loss can be reduced by lowering the excess air to the optimum value and holding it there with the aid of an oxygen analyzer. Sensible heat losses are especially important in kilns with high exit gas temperatures.

Clean Sample Necessary

The most difficult problem in obtaining a continuous analysis of stack gases in the cement industry is to furnish a clean sample of gas to the oxygen analyzer. These analyzers are delicate instruments and it is very important that all solid matter be removed from the gas flowing into them. A great deal of time has been spent in an effort to develop a trouble-free sampling system. Possibly the most satisfactory sampler is one that is furnished by the Bailey Meter Co. with its oxygen analyzer.

A schematic diagram of this sample system is shown in Fig. 3. The gas sample is delivered by means of a large water aspirator, the water for which is circulated by a centrifugal pump direct-connected to a ¾-hp. motor. Make-up water which is added to an inductor also serves to cool the gas sample. The secret of the whole system is a water spray at the end of the sample tube which removes dust from the gas sample. This looks too simple to work, but it does, and surprisingly well. A sampling system such as this has been in operation for over a year and has required very little maintenance.

The gas pump delivers about 1.5 c.f.m. of gas, a small part of which is required by the analyzer and the rest being wasted. The use of such a large volume of gas results in a very fast speed of response. A change in the coal feed to a kiln will result in a complete change on the recorder in less than one minute.

Installation Precautions

Two important precautions should be followed in installing this sample system. One is that the sample tube must be installed at an angle of 15 degrees or more from the horizontal and the other is that the water going to the sample tube spray should be filtered. Even with a water filter, it has been necessary to pull the sample tube once a month and clean out this spray nozzle. In this plant trouble has been encountered with the water pressure dropping and a pressure switch has been installed to stop the pump motor when the pressure on the water flowing to the spray drops below a critical value.

It is believed that if full use is made of the data from a properly installed and serviced oxygen analyzer, it will pay for itself in lower coal consumption. However, like any other instrument, these analyzers require a certain amount of maintenance to keep them in operating condition. This fact should be realized before the installation of any oxygen analyzer is contemplated.

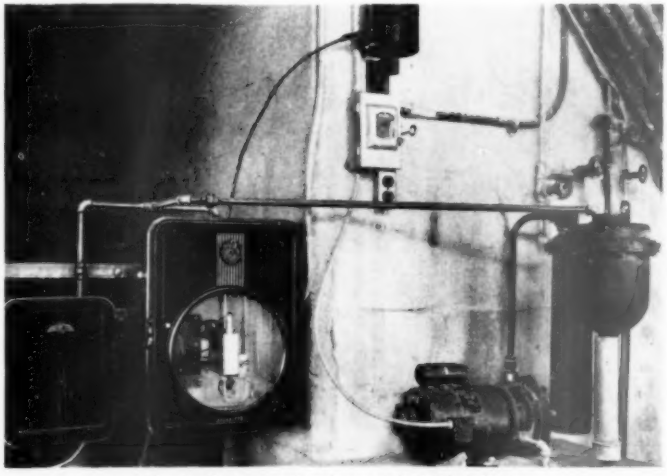
Florida Phosphate Drilling

TEST-DRILLING methods of Florida phosphate mining companies when drilling to determine the size and quality of deposits and to obtain other information needed for production and operation estimates are described in an information circular recently released by the Bureau of Mines, U. S. Department of the Interior. The report is the result of a field study of prospect drilling methods used in both land-pebble and hard rock fields. Included are maps of the area, drilling patterns, photographs and discussions of equipment used, as well as discussions of geologic conditions and average costs.

Pebble fields are in Polk County and the hard-rock area, about 100 miles long and from 2 to 30 miles wide, lies in the northwest section of the Florida peninsula. Pebble particles range in size from colloidal to several inches in dia., while hard-rock formations consist mainly of boulders weighing up to several tons.

Crusher Doubles Capacity

FRANK J. PECKA, Neosho Valley Rock Co., Burlington, Kan., has announced purchase of a new crusher which will double the company's output of crushed rock, increasing capacity to approximately 60 t.p.h. under full operation.

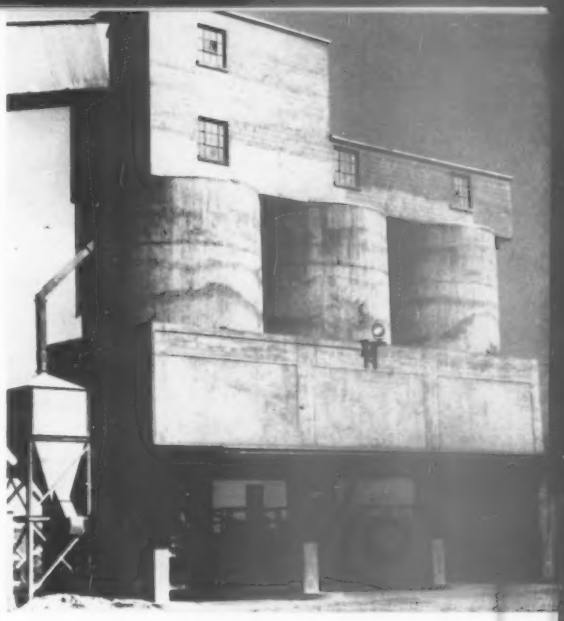


Gas-sample pump and analyzers at typical installation

Direct Firing with Tube Mills

Canada Cement Co., Ltd., at its Montreal East plant uses compartment mills with preheating chambers. Continuous oxygen analyzers and thermocouples govern kiln practice

By BROR NORDBERG

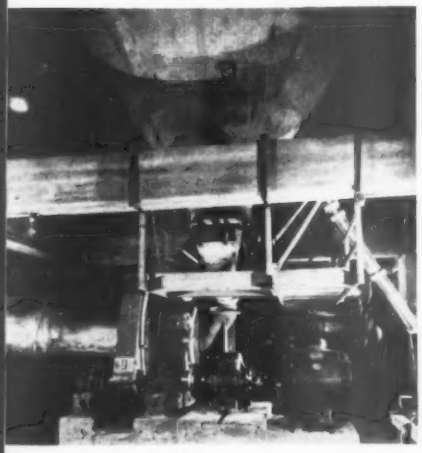


Bulk cement plant for truck-loading, constructed comparatively recently to operate independently of main packing plant

CANADIAN MANUFACTURERS of portland cement, like American manufacturers, were hard put to it to meet demands for their product throughout 1947 and 1948 and are continuing to operate at full capacity. New production records have been established each of the last several years and the 14.1 million barrels produced in 1948 (a Canadian barrel is 350 lb.) is the greatest in history. Yet, it fell short of requirements by the construction industry.

Canada Cement Co., Ltd., Montreal, Quebec, with its six producing plants and distributing points that serve the entire area of consumption from the province of Alberta in the west to the Atlantic sea coast, produces more than 80 percent of the entire output in Canada. The No. 1 plant of Canada Cement Co., Ltd., at Montreal East, Quebec, which serves an enormous local market and the entire area east and north including the maritime provinces, is by far the largest single producing mill. With a kiln capacity of 17,700 bbl. (350 lb.) of clinker per day and with its storage capacity of 1,000,000 bbl. of finished cement, this plant ranks as one of the largest in the world. It produces roughly one-third of all Canadian cement.

Feed end of one of direct-firing compartment tube mills. First compartment is a drying chamber. Overhead silo is of heavy reinforced concrete construction

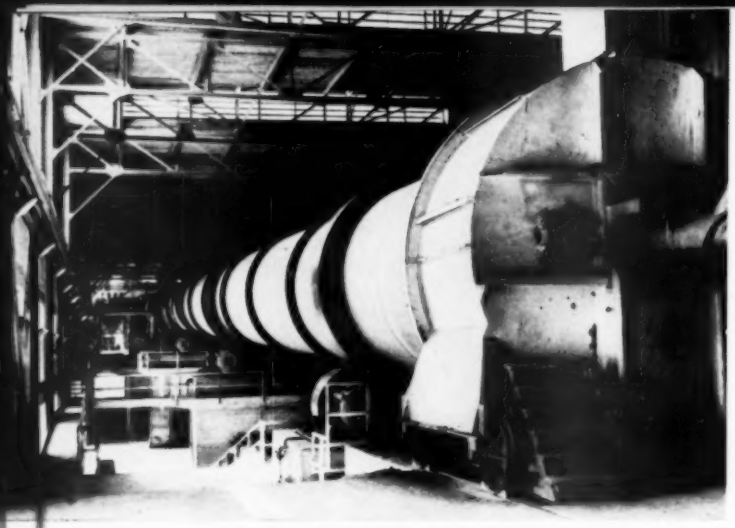


Production of this plant was stepped up some 30 percent within the past two years when much of the company's overall expansion program was undertaken and some of the modernization and enlargement is typical of what has been accomplished in other mills of the company. For example, quarry operations have been speeded up and improved through installation of truck haulage to replace railways in most of the company's quarries. The Montreal East plant is located on the St. Lawrence river, and the quarry adjacent is in the only cement rock deposit found in Canada. Trenton limestone, as it is designated, has very similar characteristics to the Lehigh Valley stone in Pennsylvania. No clay or shale is required for alumina and very little addition of silica and high calcium stone is needed in adjustment of the mix.

The plant has its own docks and unloading and storage facilities, to receive and handle coal for firing the kilns, and gypsum, and for loading bulk cement steamships. Most of the coal and all the gypsum come from Cape Breton, Nova Scotia. Coal and gypsum are transferred by rail to the plant. Approximately 20 percent of shipments are by bulk and the balance is bagged by twelve 4-spout St. Regis packers at the mill. Water shipments are made to Halifax, Nova Scotia, Quebec City, Quebec and Chatham, New Brunswick, where packing plants are operated. Sacked cement for water shipment out of Montreal East is handled on pallets, by contracted trailer-trucks, to the loading dock. The *S. S. Bulkarrier* and *E. M. V. Cementkarrier* operated by Canada Cement Transport, Ltd., transport cement, coal and gypsum.

Principal installations since 1947 include air-swept compartment tube mills for direct-firing the kilns, complete new coal-handling facilities, an auxiliary bulk cement plant for truck loading, additional grinding mills in the raw department, conversion to quarry truck haulage and the addition of a 11-ft. 3-in. by 10-ft. by 11-ft. 3-in. by 430-ft. rotary kiln with an air-quenching clinker cooler of original design. All the aforementioned additions and improvements have contributed to the growth of the plant, and will be considered herein, but other factors have contributed importantly to increased production The raw mill has been kept operating three shifts every day of the week instead of two shifts, and the finish mill has been on three-shift continuous operation instead of two for the past two and one-half years.

Milling production was stepped up in this way, and by new additions, to keep pace with greatly-increased production of clinker by the kilns. The company was among the very first cement manufacturers to convert to long rotary kilns and has had experience in the operation of kilns over 300 ft. in length since 1929. Montreal East plant No. 1 now has six big F. L. Smidth kilns in operation. In addition to the new 430-ft. kiln with separate air-quenching clinker cooler, there are in operation four 11-ft. 3-in. x 10-ft. x 11-ft. 3-in. x 352-ft. kilns, and No. 5 kiln measures 9 ft. x 8 ft. x 9 ft. x 324 ft. All five of these kilns have Unax integral coolers and each of the six kilns has a restricted diameter calcining zone. All have F. L. Smidth heat exchanger chain systems, speed



Firing end of 430-ft. rotary kiln

of rotation synchronized with kiln feed by conventional ferris wheel feeders, ½-in. slope to the lineal foot, and they rotate at approximately 1 r.p.m.

Production from the older kilns has been increased sharply in the face of high demands. Prior to the war, each of the 352-ft. kilns produced 2200 bbl. of clinker per day. Output from these same kilns was stepped up to 2400-2500 bbl. each during the war years, and now has been increased to 3000 bbl. per day. The kilns have been pushed, like many in the United States, at the sacrifice of some fuel in order to gain extra production but some of the installations made and mentioned earlier have had bearing. One of the limitations in earlier years was in coal-grinding capacity, which was sharply increased by installation of the direct-firing tube mills which will be considered later. Firing ends of the kilns were changed to eliminate air leakages and thus permit more controlled burning conditions. The integral coolers were lengthened and were made solid by replacing the elbows and were lined with silicon carbide brick for the first 5 ft. to eliminate spillage and attendant air leakage.

Discharge end of direct-firing tube mill. Mills are air-swept

Better control of air volumes and the rate of coal feed made possible by these improvements has resulted in more uniform burning conditions, with lowered refractory brick maintenance and the practical elimination of kiln ring formation, which have added much to maintenance of high average clinker output per day.

Production from No. 5 kiln, 324 ft. in length, is 1700 bbl. per day, which is the least favorable, and from No. 6 kiln is 4000 bbl. per day which likely will be increased to 4200 bbl.

New Kiln

Kiln No. 6 started production in June, 1947. The first 135 ft. of its length, measured from the firing end, is 11 ft. 3 in. in dia. followed by 10 ft. of tapered section, 145 ft. 4 in. of 10-ft. 3 in. dia. calcining zone, another tapered section, and 129 ft. of 11-ft. 3-in. dia. section. It is lined throughout its length.

Magnecon refractories line the hot zone followed by 70 percent alumina brick and Superduty fire and Moler insulating brick back to the chain section which is lined with wear block. Magnecon brick, when properly protected by a suitable coating, have given excellent service particularly when a kiln is forced, in the experience at this plant. They give from six to eight months' service in the hot zone. The chain section starts 17 ft. from the back end of the kiln and extends for a distance of 95 ft. Chains consist of 14-ft. lengths of ⅝-in. chain.

The kiln is supported on six tires and is driven by a 100-150-hp. G. E. variable-speed direct-current motor through a Dominion speed-reducing gear unit. The drive is synchronous with the ferris wheel slurry feeder drive through an electrical tie. The kiln is fired under induced draft by a fan driven from a 100-hp. motor through V-belt. Draft is changed by adjustment of the louvres at the back end of the kiln through F. L. Smidth louvre control from the kiln burner's station. In event of power failure the kiln has an alternate drive, a Hercules gasoline engine, that may be quickly pressed into service through a Twin Disc clutch. It will be noted from the accompanying illustration that kiln drive motors are air-cooled by forced-draft fans.

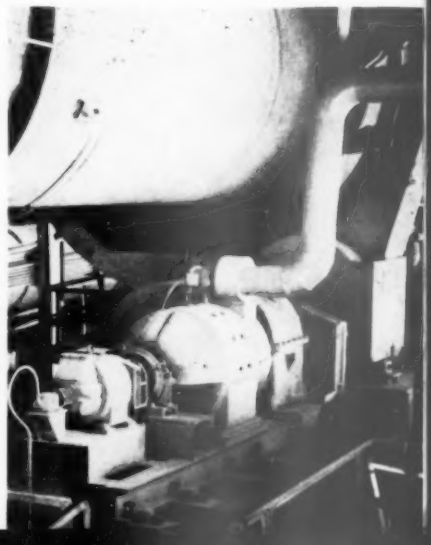
Clinker Cooler

The "Narsted" clinker cooler, designed by John Narsted, vice-president in charge of production, is a horizontal grate-type, air-quenching cooler. Clinker is moved horizontally over a stationary air grate by heavy cast steel drag bars. The grate is 6 ft. wide by 32 ft. long. The drive is a Vickers hydraulic pump unit which is said to provide variable speed control within very accurate limits. No sprockets or chains are used.

A butterfly deflector is the means of directing the quenching air in desired proportions through the primary and secondary windboxes of the cooler. By having a tight seal on the kiln hood overhead, all the secondary combustion air entering the kiln is that forced through the hot bed section of the clinker cooler. The balance of the cooling air discharged through the colder part of the clinker bed is exhausted to waste. A 3- or 4-in. bed of clinker is carried on the cooler grates and air is supplied by a Buffalo fan rated at 65,000 c.f.m. when operated against a static pressure of 10 in. of water. The fan is direct-driven from a 175-hp. motor.

Clinker temperature drops from

Close-up of drive on 430-ft. kiln. Note provision for air-cooling of electric motor. Gasoline engine is available for emergency service



2700 deg. F. in the kiln to 2200 deg. F. as the clinker reaches the cooler and is cooled to an average of 100 deg. F. upon discharge to either of two 24-in. rubber belt conveyors for delivery to storage or to the finish mill feed bins. Small sizes of clinker are cooled to 60 deg. F. In the case of the other five kilns, clinker is passed through secondary coolers before being handled by belt conveyor.

Coal Handling

The kilns are fired by 13,000 B.t.u. bituminous coal, 8-9 percent ash, received by steamship from Nova Scotia or, on occasion, received from sources in the United States. Top size, as delivered to the plant unloading hopper is ¾ in. The new coal-handling system consists of a Robins car shaker discharging into a steeply-inclined self-cleaning hopper, and a 36-in. belt conveyor delivering into six overhead silos arranged in a row, from which the grinding mills are fed separately. The silos are of heavy 10- and 12-in. reinforced concrete construction with conical bottoms and hold 330 tons of coal, each of which is sufficient for 48 hr. of operation.

Coal Pulverizing

The company is standardizing on individual compartment-type tube mills for the direct-firing of kilns with pulverized coal and has some ten in service. Six are operating at Montreal East in firing all the kilns, five of which are the company's own design. The sixth is a commercial mill. They are heavy, slow-running mills and have given excellent service with low maintenance cost. One of the principal reasons for their selection was the high degree of moisture in present-day coal, necessitating the introduction of high temperature air in great quantities in order to grind the coal to required fineness, which is 90 percent minus 100-mesh in this case. Other factors considered were maintainance and reliability under continuous service conditions.

View of 430-ft. kiln taken from feed end

Each of the five large pulverizers, including that for firing No. 6 kiln, is a tube fitted with large diameter trunnions on each head revolving in water-cooled bearings, and measuring 25 ft. 4⅞ in. between the centers of the trunnion bearings. Outside diameter is 5 ft. 6 in. The mill is turned by a heavy ring gear and pinion which are totally enclosed, with a 900 r.p.m. motor direct-connected to the pinion shaft through a spur gear reducer and flexible couplings.

The mill has three compartments, and the first, about 5 ft. long, is strictly a drying compartment for rapid drying out of moisture before the coal is passed successively through the second and third compartments for pulverizing. Short radial lifters in the first compartment cascade the coal through the hot air stream drawn from the kiln hood to promote fast drying. The second compartment is 5 ft. 10 in. long, is lined with steel plates, and carries a charge of 6000 lb. of 2-in. grinding balls, while the third compartment, 11 ft. 1 in. in length, has hard iron liners and is charged with 12,000 lb. of 1¼-in. grinding balls. Radial lifters move the coal from the drying chamber into the first grinding compartment.

Feed from the overhead bin is by a totally-enclosed table feeder, fed through an adjustable spout which permits wet coal and lumps to flow freely. A 2-hp. variable speed direct-current motor, with rating of 600-1500 r.p.m., drives the feeder through double-reduction worm gear reducer. Approximate adjustments of the mill feed are done manually but accurate adjustments are accomplished at the kiln control panel where the speed of the feeder drive motor may be changed.

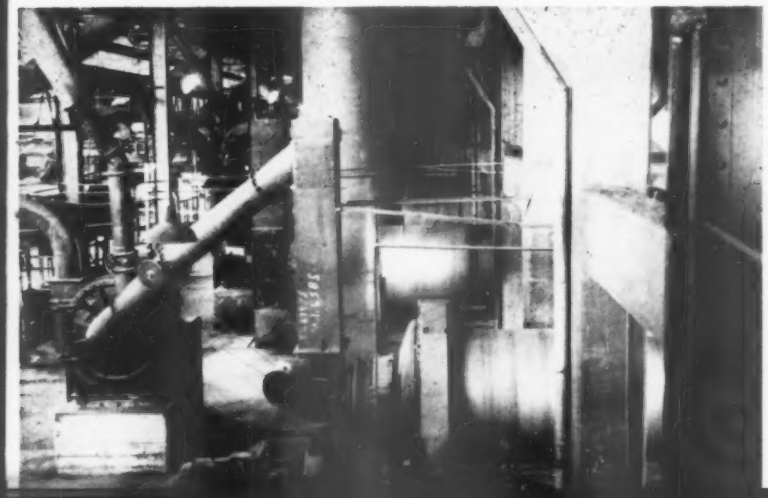
Connection of the heated air pipe, from the kiln hood, is such that the feeder is subjected to heated air in order to prevent building up of coal.

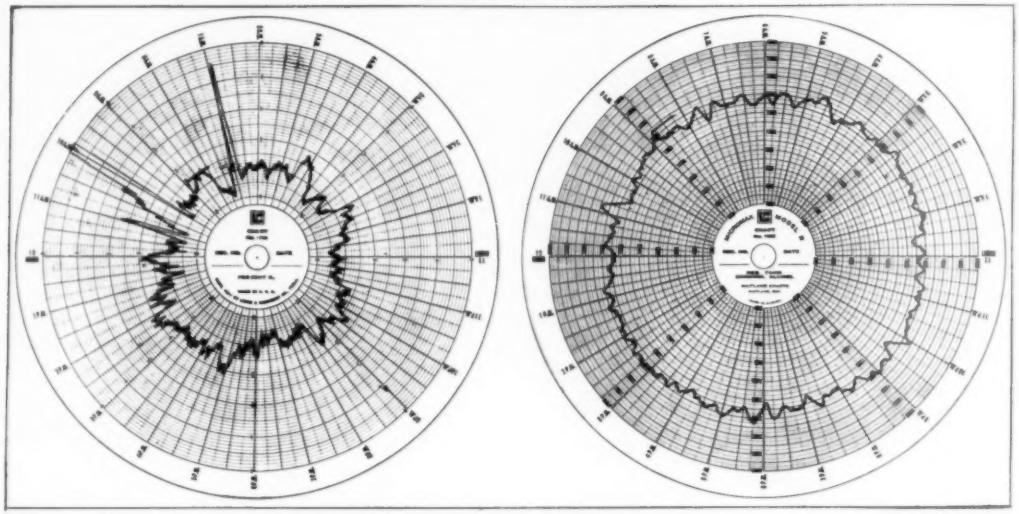
Both mill trunnions have internal screws to facilitate flow of coal into the mill, the one at the discharge end serving to return coal rejected because of coarseness. For that purpose, there is a vertical pipe coupled to the discharge end trunnion to reject coarse particles which then drop into the spiral screw flight.

Velocity of the primary air-coal mix, out of the mill is limited to a maximum of 250 f.p.m. by design, which insures sufficient fineness of grind. The mix of air and coal enters the fan through a pipe which is an off-shoot near the top of the standpipe. An adjustable valve on this pipe is the means for regulation of the amount of air swept through the mill. The primary air pipe from the kiln hood has an off-shoot pipe to the coal-air line at a point between the mill and the fan as a means to raise the temperature should that be necessary. The fan is driven by a 1200 r.p.m. motor.

This type of mill lends itself to the use of approximately 20 percent primary air, which is some two-thirds of the amount commonly used with other types of mills, and has the advantage of permitting air as hot as 600 deg. F. or more to be passed through in the drying of wet coal. In the case of kiln No. 6 which has a 4-ft. burner pipe

Battery of direct-firing unit, tube mills which are air-swept and have provision for return of oversize coal particles. Fans are on left





Left: The rapid increase in oxygen in this case measured by the oxygen analyzer (note high point on graph) was due to a blockage of coal feed. This condition was indicated and recorded within a minute or two after the stoppage of coal took place. Right: Typical continuous record of secondary air temperatures as measured by thermocouple in the windbox of air-quenching clinker cooler (Reduction 3.1:1)

and burns up close to the kiln hood with a shorter and hotter flame than is possible with the other kilns, the hot air is admitted into the mill at 600 deg. F. This is sufficient to dry coal well in excess of the 12 percent moisture sometimes encountered. In the case of the four 352-ft. kilns, this temperature is 370 to 400 deg. F. Temperature of the coal-air mix injected into kiln No. 6 is in the 220-230 deg. F. range while that for the four identical shorter kilns is 170-180 deg. F. The figure desired is 200 deg. F. and cold air can be admitted into the mill if higher temperatures make it desirable.

According to experience, the maintenance of the desired coal-air ratio is not difficult with the use of compartment mills like these. It is comparatively seldom that re-setting of the damper between the grinding mill and fan is needed. To get more coal, the operator normally just speeds up the coal feeder but in some extreme cases it may be desirable to re-set the air damper. Length of the flame and its characteristics will influence the burner's judgment as to whether or not air volume needs adjustment.

Burner pipes, which are long in the case of the Unax kilns, are insulated with asbestos cement inside the kiln, protected by heat-resisting steel sleeves.

Tramp iron presents no feeding problem into the mill and clinker dust is not a factor on fan wear since it is diluted with pulverized coal before entering the fan. The mills each grind approximately five tons of coal per hour with a grinding media consumption less than one-quarter of a pound per ton of coal pulverized. Power consumption is close to 25 kw.h. per ton of pulverized coal.

Point of withdrawal of gas sample at back end of kiln for oxygen analysis

Kiln Operation

All kilns in the plant are fired by maintaining constancy in kiln speeds, air velocities, primary-secondary air ratios, burner pipe velocities, air velocities and all other firing variables; adjustments are confined insofar as possible to varying the rate of coal in maintaining optimum conditions. Each kiln has an F. L. Smidth centralized control panel at the operator's station, with all the switches, signals, measuring gauges and control instruments of both indicating and recording type.

Kiln No. 6, being the newest and one of two equipped thus far with a continuous oxygen analyzer, is being fired under more closely regulated conditions than the others and, due in part to its great length, is more efficient in fuel efficiency and general performance. It has a 9-in. coal burner pipe extending just inside the kiln hood, is fired at 2700 deg. F. with a relatively short, intense flame as compared to the others, and practically all the combustion air utilized, in addition to 20 percent primary air injected with the fuel, is air preheated when forced through the hot clinker passing over the air-quenching clinker cooler. The kiln is operated at 0.2

Continuous oxygen analyzer which measures oxygen continuously by a method of combustion with hydrogen

in. of draft measured at the feed end, and its coal mill with a 2-in. mill differential.

Principal control devices comprise thermocouples inside the breeching at the back end of the kiln and at the point where the kiln load comes out of the chain section; a continuous recording Leeds & Northrup oxygen analyzer; and thermocouple to measure the temperature of the secondary air as it leaves the cooler. These measurements are recorded on Micromax instruments.

Exit temperatures are held at 535 deg. F. at present high rates of production and the temperature is kept as near 1500 deg. F. as possible at the point of emergence of the load from the chain section which is effective in reducing moisture in the material to 7 to 9 percent. Slurry is fed into the kiln at 34 percent moisture.

Exit gas temperatures are, of course, an important control device in any kiln operation as an indicator of fuel efficiency, possible ring development, excess air or air deficiency but are not used for more than a matter of record on kiln No. 6. The thermocouple at the chain section and the continuous oxygen recorder are the control devices used almost solely for governing firing conditions and for adjusting burning conditions. Continuous gas analyses are considered as almost imperative due to the wide variations in quality of coal today.

The Leeds & Northrup continuous oxygen analyzer and recorder measures oxygen by the principle of removing it through combustion with hydrogen and comparing the thermal conductivity of the gas mixture before and after the combustion. Because of the relatively high thermal conductivity of hydrogen as compared to other gases including oxygen, small changes in oxygen concentration are detected and readily measured. It is an electrical apparatus without mechanical moving parts. The gas sample is continuously taken from the point where the gases come out the back end of the kiln and is drawn through a filter located inside the kiln and a cotton filtering cartridge in the sample line before entering the analyzing cabinet alongside the kiln. Hydrogen is mixed with the gas sample in the sampling line and the thermal conductivity measured by a thermal conductivity cell. After combustion in a chamber, a second cell measures the now lowered thermal conductivity and the difference in the readings is a measure of 0_2 as recorded on the Micromax at the kiln control panel.

In the operation of a long kiln like No. 6, it is considered essential to good burning and the anticipation of changing conditions within the kiln to be able to detect variations quickly. The time lag of 15 to 20 minutes involved when depending upon exit gas temperature readings is considered undesirable whereas, with the oxygen analyzer, changes in the Micromax reading indicate the effect of changed firing conditions in one to two minutes after the change has occurred.

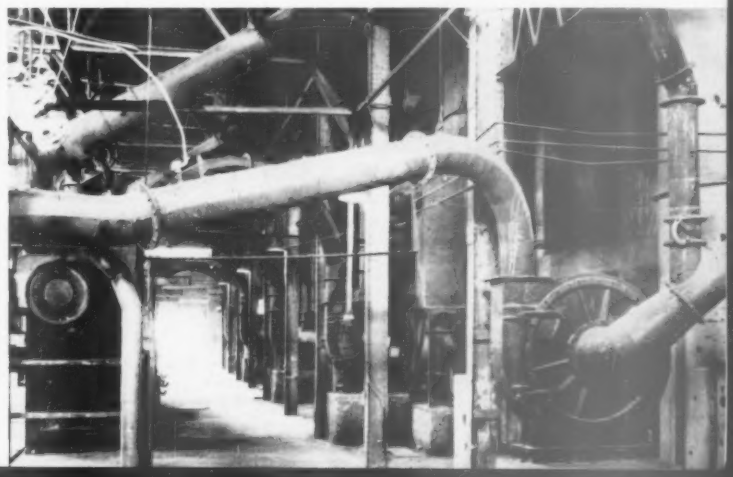
At any holding point a run of poor coal or insufficiency of coal will reflect in an almost immediate increase in the 0_2 reading and adjustment of the coal feed can be made quickly to bring the reading back to the desired figure. Free oxygen in the exit gases is held to one and a fraction percent. Actually, the instrument is a coal control device as used for these kilns. Adjustment of the draft louvres is made only when the coal-air ratio is upset considerably due to marked changes in quality or amount of the coal. The hourly charts, like the one used herewith for illustration, reflect the coal feed changes that have had to be made. Through experience gained, the burner is able to interpret from the readings when the kiln load is starting to roll down on him and prepare for the condition. A continuous slightly downward trend in the 0_2 reading, for example, may indicate the building up of a ring obstruction in the kiln. If the reading goes up suddenly, a blockage at the mill coal feeder may likely be to blame and the condition cleared up quickly. The draft fan is constant speed and the louvre changers are opened and closed from the operator's station in making draft adjustment.

Temperature as measured by the thermocouple at the chain section is considered a very important control

(Continued on page 172)

Quarry is just across main road from cement plant, with belt conveyor underneath

Centralized control panel for firing 430-ft. kiln. The two instruments on left record oxygen analysis in exit gases and temperature as measured by thermocouple at the chain section



Individual fans to air-sweep tube mills for grinding coal and to inject the primary air-coal mix into kiln. Overhead feed silos may be seen on right.

CONFUSION of Research Data

What properties of cement, aggregate and concrete are most important?

By NATHAN C. ROCKWOOD

NO SMALL PART of the difficulties in attempting to read, digest or assimulate research data on cement, aggregates and concrete arises from not being able to differentiate between physical and chemical effects or results. It is possible, however, by picking up data and theories, some here and some there, from the vast volume of literature, to relate various items and draw conclusions that throw some light on both new and old discussions. Of course, this has been done many times by experts, and if they are human, each is more or less prejudiced by his special knowledge of some one or more of the sciences involved, or by perhaps his unconscious desire to prove or disprove some pet theory or experiment. There is obviously a great opportunity for a person with no preconceived ideas to examine the whole and to try to reconcile the much data that on the surface appear to be irreconcilable. That is what we would most like to do in our spare time; and it is hoped we may at least have some success in recalling possibly forgotten or long overlooked material.

The end qualities desired in cements, aggregates, and the resulting concrete, are necessarily physical—ability to form a plastic mixture, to set and harden within a reasonable time, to develop strength or resistance to fracture under loading, to have durability or resistance to weathering and to the ordinary vicissitudes of usage. In the final analysis the nature of the ingredients employed to accomplish these results is immaterial. That manufacturers and users of cement and producers of aggregates employ modern physics and chemistry in solving or attempting to solve their problem of making better concrete is chiefly to throw some additional light on the desired physical properties.

From one angle, at least, this has some times served to obscure or confuse the real issue, which is good durable concrete regardless of its nature; and there are probably various ways of doing it. In the days before portland cement, there was but one requirement for an hydraulic cement; one that was established by experiment and experience to make it serve the purpose intended. Only after men interested in pure scientific research began their investigation of the nature of cements and of concrete was any attempt made to describe them in terms of chemical formulas and equations. All this has been most interesting and helpful in developing better cements and concrete, but in numerous instances it has not helped to draw the line between faults caused by physical properties, including those due to workmanship in construction, and those caused by the chemical or mineralogical composition of either the cement or the concrete.

Cement the World Over

One would be hardly rash enough to say that the United States makes the best cement in the world, or that we are outstanding in the quality of the concrete made with it, yet this country and Mexico are the only portland cement manufacturing countries which attempt to make cement to rigid chemical specifications. In the case of Mexico, we presume that is because of its proximity and the fact that it has used a great deal of American cement, so its specifications are drawn more or less to parallel ours. It is easy now to check specifications because we have before us a "Tabular Review of the Portland Cement Standards of the World," just received from the Cembureau, the Cement Statistical and Technical Bureau, Malmö, Sweden.*

The most that any foreign country attempts in the way of specifications to cover the chemical composition of portland cement is to prescribe the hydraulic modulus or the limits of lime (CaO) to the argillaceous materials [silica (SiO_2), aluminum oxide (Al_2O_3) and iron oxide (Fe_2O_3)]; and in a few instances, the Al_2O_3 to Fe_2O_3 ratio. The specifications in Canada, which probably also are influenced by American standards, limit the SiO_2 to $Al_2O_3 + Fe_2O_3$ ratio to a minimum of 2.8 and the Fe_2O_3 to Al_2O_3 ratio to a maximum of 1.3. The commonest requirement is a $\frac{CaO - CaO \text{ in Gypsum}}{SiO_2 + Al_2O_3 + Fe_2O_3}$ ratio with a minimum of 1.7. In France, Germany, Sweden and Belgium, all of which have been and probably are destined to become again competitors of the United States, there are no chemical requirements whatsoever. The nearest approach to American specifications are those of Great Britain and Eire (Ireland) which prescribe the lime ratio thus:

$$\frac{CaO - CaO \text{ in gypsum}}{2.8\ SiO_2 + 1.2\ Al_2O_3 + 0.65\ Fe_2O_3}$$

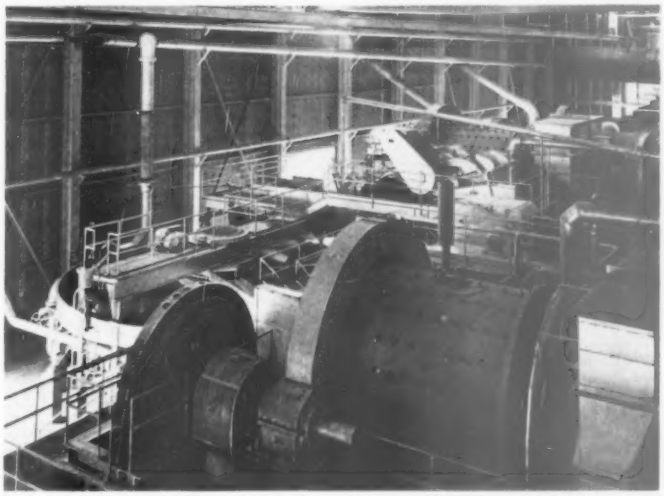
*Malmö, Sweden, Stormigatan 16 price $2.50.

Pressurized silos at Oro Grande, Calif., plant of Riverside Cement Co.

with a minimum of 0.66 and a maximum of 1.02 (for ordinary portland cement). Only in the United States (and Mexico) is any attempt made to specify limits of each oxide, or of the compounds 3 $CaO.SiO_2$, 2 $CaO.SiO_2$ and 3 $CaO.Al_2O_3$.

Do we know more about cement than all the rest of the world, or have we merely stuck our necks out farther? If our portland cements actually made better concrete than anywhere else, there might be some justification for such extreme specifications, but that doesn't seem to be the case, or constructors and cement manufacturers abroad have been adept to keeping the ills of their concrete quiet, while we have broadcast ours. The logical conclusion seems to be that foreign cement manufacturers and concrete engineers are still guided by the physical requirements of the resulting concrete and are not greatly interested in the proportions of chemical or mineralogical ingregients in their cements or the aggregates used with them, if these make good concrete. This conclusion was more or less verified by American cement and concrete experts who recently examined the German concrete highways.

Another feature in which American cements differ from those made in other parts of the world is in the fineness of grinding. Of course, everyone is familiar with the stock arguments that cement has no cementing properties unless it is all finely ground. Yet the fact remains that early American natural cements and early portland cements in many instances did a pretty fair job when ground to nowhere near the fineness of present-day American portland cements. Elsewhere in the world today the practically universal specification for fineness, except in Canada, Mexico and the United States, is measured in percentage retained on a testing sieve with 4900 openings per square centimeter. This is sometimes specified as an opening of 90 microns, and corresponds to an American standard testing sieve with 178 meshes per square inch, although the 90-micron size opening corresponds most closely with a No. 170 Tyler standard sieve (88 microns).

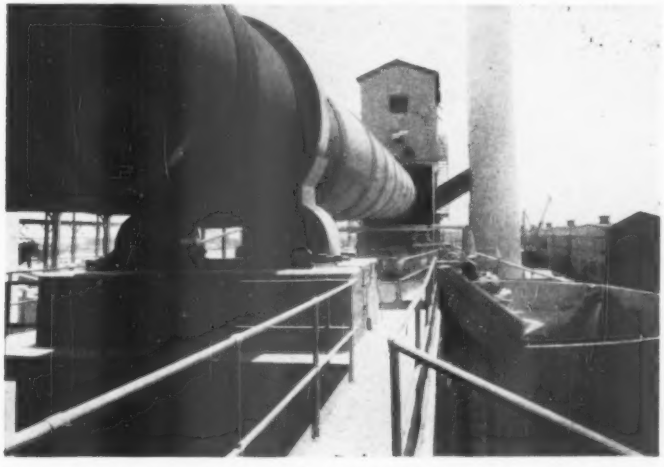


Secondary, raw ball mill, foreground and preliminary mill, background, at Portland, Colo., plant of Ideal Cement Co. Note kilns extending through mill building, background

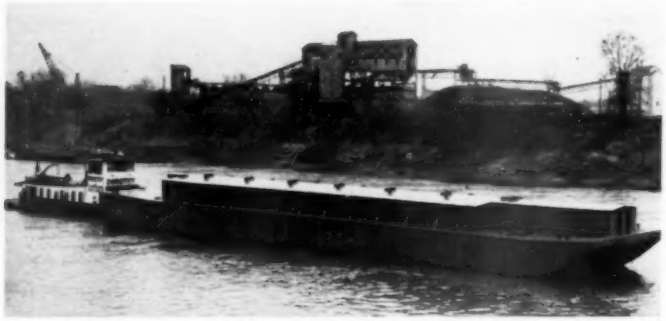
The maximum permitted to be retained on a 4900 metric sieve in most foreign specifications is 15 percent, but in Czechoslovakia, Germany and Hungary, it may be as much as 20 percent; in Holland, it is 18 percent. Nor is as much as 2 percent retained on a 900-mesh metric sieve cause for rejection of some European portland cements. A 900-mesh metric sieve corresponds to our No. 70 standard sieve, which is in the range of our sand or fine aggregate sizes (200 micron opening). It seems obvious, therefore, that European cements are not only coarser than ours, but that they also must have a gradation of particle sizes which actually overlaps the fine aggregate sizes. If the grinding is done in open circuit and the product follows the laws of crushing, which have been shown to extend to fine grinding, that is the logarithmic curve of gradation of sizes is approximately a straight line, European portland cements have only between 65 and 70 percent in the less-than-40-micron sizes, which American experts usually consider the limiting size of "active" particles.

It would appear from this analysis that European cements must pack tighter, having a wider range in particle sizes, and therefore probably "bleed" more. So far as we can tell from our reading of experience with cements in Europe, engineers are not so concerned about "bleeding" as we are in this country. It is well known that European engineers generally use dryer mixes than we do; and if we understand the laws of plasticity or workability, this is entirely possible, because good continuous grading of both cement and aggregates makes relatively dry mixes that are workable.

There appears to be ample evidence that we have gone entirely too far in fine grinding cements, merely to achieve fast hydration, early hardening and high early strength. That we have sacrificed other desirable qualities that European engineers and manufacturers have appreciated and



Note enlarged diameter drying section of feed end of 374-ft. kiln at New Orleans, La., plant of Lone Star Cement Corp.



Self-unloading barge, 195 ft. in length, operated by Missouri Portland Cement Co.

retained seems obvious. The desire for early strength has been universal, but our European contemporaries appear to have achieved it, or at least some degree of it, without going to the extremes in specifications practiced in this country. It is only in recent years that we have become so concerned about "bleeding" cements. To me, it still means only that the particles are well graded in size and packed closely, as they should; and that a cement which does not bleed is merely one of such uniformly fine particles, that it continues to hold on to an excess of unusable water.

Particle Size and Hydration

There is another angle to gradation of particle size which is no longer studied much in this country, although at various times it has been mentioned by writers on cement. In recent writing and research it has been emphasized that particles over about 40 microns in size hydrate so slowly as to be practically valueless as cement. Much has been made of the fact that many hardened cement specimens of the "old-fashioned" portland cements, when reground, even several times, show that many of the cement grains have never been completely hydrated and serve merely as aggregate. Hence, the conclusion is drawn that if we want a 100 percent cement, it should all be ground so that it will hydrate within a "reasonable" time.

If it is the intention to make "100-year concrete," as announced by the U. S. Army Engineers, then it would appear not to be amiss to use cement that continues to retain some life and capacity for activity beyond the usual 28-day, or even 1-year test period, especially if it is to be perpetually saturated with water. The proved continued growth in the strength of some similar old concrete, such as that described by H. S. Mattimore, in recording tests of cores from the Holtwood dam on the Susquehanna River in Pennsylvania* could perhaps be as well ascribed to the cement made under specifications of some 40-odd years ago as to good aggregates and good workmanship. Mr. Mattimore could not find out much about the cement used in that particular structure, except that it came from Lehigh Valley plants.

From Taylor and Thompson's "A Treatise on Concrete," first edition, published in 1906 (about the time the Holtwood dam was being built) we can get a fair idea of the character of the cement and concrete then considered satisfactory. The A.S.T.M. specifications of that period allowed not more than 8 percent retained on No. 100 sieve, and not more than 25 percent on No. 200. That is to say that 25 percent of the cement was probably between the 74- and 200-micron sizes, if the sieve mesh sizes were the same as present standards. Thus, present European cements are ground to fineness much nearer our American cements of 40 years ago than to present-day American cements. The "bleeding" and laitance of cement and concrete did not worry the engineers of 40 years ago, although, according to Taylor and Thompson, laitance was recognized as containing the finer fractions of the cement, and according to analyses by Clifford Richardson, it was especially high in alumina and iron oxide, containing somewhat less a proportion of silica than the cement itself. In other words as we know now, it contained the quickest hydrating materials.

From what we have learned about the ingredients of hydrated portland cements in the last 40 years, it would appear that the loss of the hydrated aluminum and iron compounds might have been more beneficial than otherwise, since it is generally held that they contribute little or nothing to the ultimate strength of the hardened concrete. Laitance apparently was considered a necessary nuisance, but not particularly harmful; the cure was a dryer mix, or the use of a little more cement, since lean mixes apparently resulted in more laitance than richer ones. When clear water bled from the concrete it was considered good riddance. Also, although 40 years ago no one was interested in that particular subject, the laitance probably carried off most of hydrated alkali solutions; which may be one reason why our predecessors had no troubles with "reactive" aggregates—for such must certainly have been used in many structures.

Coarse Grains Are Useful

Present-day researchers on the causes of concrete disintegration appear to have lost sight of some of the earliest data connecting the hydration and hardening of cement and concrete

*Engineering-News Record, November 27, 1947, p. 53.

Shovel loading split-type, side-dump body truck with 40-ton capacity at San Andreas, Calif., quarry of Calaveras Cement Co.

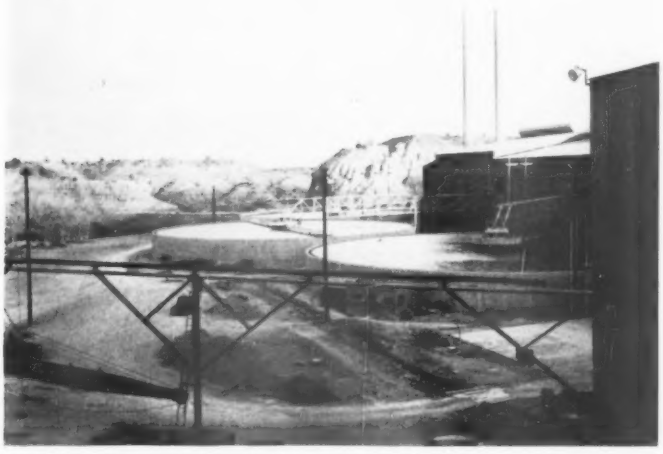
with colloidal phenomena. For example, Wm. Michaelis in describing the action of water on the cement grains to form an outer coating of silicate gel, believed the final set and hardening to be caused by the absorption of the excess water by the coarser grains, which resulted in constant replenishment of the silicate (or probably silica) gel. Many of the present-day experts agree in whole or in part with Michaelis' observations and conclusions. Dr. R. H. Bogue in his "The Chemistry of Portland Cement," p. 41, states; "There is a difference of opinion with respect to finer grinding, *but it is usually maintained that the cement will develop its strength the more rapidly the finer it is ground; but that very quality may deprive the cement of a reserve of hydratable material which may be of very great value*" (Italics are our own). Evidently European cement manufacturers believe it *is* of very great value.

That very fine grinding, as practiced in the United States, is essential to high early strength (and other alleged virtues as well) seems to be disproved by Italian specifications. The only fineness requirement there is a product not exceeding 2 percent retained on a 900-mesh metric sieve (200-micron size particle). Yet, Italian specifications require 7-day compressive strengths (of 1:3 mortar cubes) of ordinary portland cement of over 5400 p.s.i.; 28-day strengths of over 7100 p.s.i. For their high-early strength portland cements (the same fineness specification) they demand 3-day compressive strengths of over 4000 p.s.i., 7-day over 7100 p.s.i., and 28-day almost 9700 p.s.i. These are the highest strength requirements we can find in any specification, yet apparently they permit a coarsely ground cement, provided we presume, it has good particle size gradation. It is true that their mortar is much more compacted in the forms than ours, but even with that qualification, their cements appear to be exceptionally good.

Truck, left, is dumping minus 6-in. stone from quarry to hopper of final screening station at Wolf Creek dam job of Cumberland Quarries, Inc., Indianapolis, Ind.

The Michaelis theory was that needle crystals of calcium hydroxide formed first, projecting from the particles of hydrating cement, and that these were subsequently enclosed by the gel. As we have suggested elsewhere (ROCK PRODUCTS, May, 1949, p. 69-71), it seems just as probable that silica (and/or alumina) gel full of minute pores and capillary channels is formed from the dissolving action of the lime and alkalies on the silica, and that the calcium hydroxide crystallizes, or is deposited on the surface and in the pores of the gel, similarly to the formation of the soluable alkali silicates. It is immaterial which forms first, the calcium hydroxide or the silica gel, the point is that these so-called hydrated calcium silicates do have more or less separate and distinguishable ingredients, although the current accepted hypothesis is that the cement particles hydrate directly to a calcium silicate gel, from which some of the calcium hydroxide subsequently crystallizes out.

In order for the cement to have lasting cementing qualities and form a stabilized concrete, the silicate gel must continue to fill the voids in the crystalline products of hydrated cement, regardless of what their character may be. If, as we have suggested, the gel formed in the process is actually nothing more than silica (or alumina) gel; then according to "The Chemistry of Cement and Concrete," by F. M. Lea and C. H. Desch, p. 170, the fresh gel is "unstable and begins to shrink, expelling water from the mass, undergoing a process known as syneresis. During syneresis no volume change occurs in the whole system (gel plus water) and the process consists simply in the expulsion of free liquid enmeshed in the gel, the shrinkage of the gel reducing the available pore space." This liquid is expelled from the gel, even when the specimen is submerged in water, so that it stays in the concrete, and to be useful should have more cement grains to hydrate.

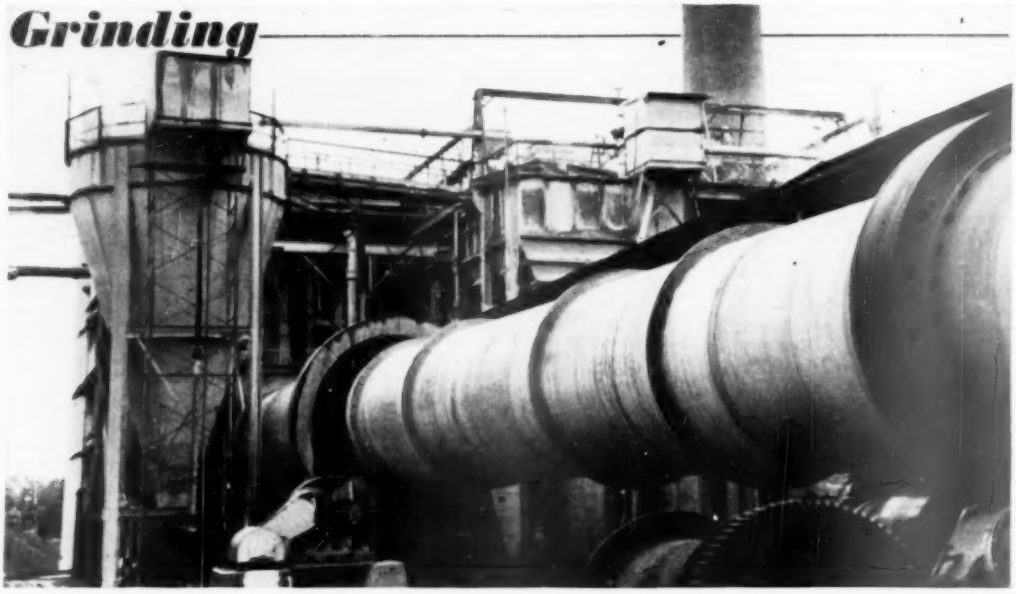


Two of three thickeners at Portland, Colo., plant of Ideal Cement Co. Kiln stacks, background

Effect of Cement Composition

We have endeavored to show that regardless of the chemical composition of the cement grains, there appears to be plenty of evidence that gradual hydration, because of the different sizes of the particles, is a distinct advantage if the excess water always present in concrete is to be usefully employed instead of merely being held in the pores of the solidified silica gel and in the fine pores of the concrete and aggregates. In order to get this desired gradual but continuous formation of gel and extraction of surplus water there evidently is a very important time element, for the gel is formed through the interaction of the lime and silica. Both of these ingredients must be in solution (or colloidal suspension) at the same time and in proper proportions. That the reaction between the concentrated solutions is relatively slow has been proved by many experiments, but it is appar-

(Continued on page 182)



New kiln taken from firing end, showing constant head air-lift feeder on left

Clinker Grinding With Ball Mills

Louisville Cement Co. uses large ball mills in series grinding; also installs waste-heat boilers and new kiln in re-building program

By BROR NORDBERG

AN ENTIRE NEW clinker grinding department of unusual and flexible design, one new kiln, three waste heat boilers with economizers and electrical precipitators comprise the postwar plant rehabilitation and improvement program recently completed by Louisville Cement Co. at its Speed, Ind., mill.

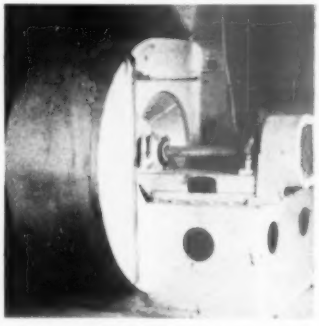
The plant at Speed is a dry process, waste heat operation producing standard portland cement, high early strength cement and air-entraining cement; alongside is the company's separate Brixment masonry cement plant. Capacity of the portland cement plant, which is the subject of this article, is rated at 1,825,000 bbl. of cement annually. Improvements and additions considered herein were not made for the purpose of increasing overall mill capacity but to increase operating efficiency of the departments involved.

Clinker Grinding

Until the new clinker grinding department went into production in June of this year, cement was ground in open circuit by two-stage milling. The old grinding department is still intact and is being utilized to partial capacity, supplementing the new mill which, in its design, has provision for enlargement later to double its capacity.

The new mill has some interesting features and has a high degree of flexibility incorporated into its design which will be put to advantage in the study of various grinding circuits and their relative efficiencies, in actual plant practice. It consists, basically, of a clinker crusher, two Allis-Chalmers 9- x 15-ft. ball mills, an 18-ft. Raymond mechanical air separator, Norblo dust collectors and an auxiliary blending bin whereby other products or additives may be introduced into the circuit through feed into the air separator. Enclosed screw conveyors and elevators are used for material movement throughout except for the finished product which is pumped by a 10-in. Fuller-Kinyon pump into silos.

Presently, the preliminary mill product is elevated and spouted into the feed hopper of the secondary mill, and the secondary mill product is elevated and put through the air separator. Rejects are returned to the prelim-



Fan that provides air for large bag-type dust collector which vents grinding mills

inary mill. This amounts to two-compartment mill operation, but by use of two separately-driven grinding units, so that there can be variations in the handling and feed of the reject stream. With this circuit, and an approximate 300 percent circulating load, according to a preliminary test, 145 bbl. of standard portland cement were ground to 1700 Wagner specific surface per hr. By sieve tests, 93 percent passed a 325-mesh sieve and 98.5 percent a 200-mesh sieve. With a feed rate of 145 bbl. per hr. into the preliminary mill, some 580 bbl. per hr. were being fed into the secondary mill and being put through the air separator. Flexibility features provide conveying equipment whereby, if desirable or at least for comparative test, the rejects can be put through the secondary mill instead of the preliminary mill or any proportion can be returned to either mill. It may be that the circulating load will be reduced, should it prove desirable and practicable to produce a cement of definite "graded" characteristics.

Aside from the flexibility that the use of separate mills provides, short mills were selected because it was believed that less heat would be generated in grinding and that power consumption would be favorable. It is anticipated that power utilization, including that for the clinker crusher, will be close to 9 kw.h. per bbl. of cement ground. The mills are air-swept and air is bled in through the air separator by one of the dust collectors with the result that temperature rise in the mills is unusually low. Clinker as fed into the preliminary mill at 185 deg. F. will be ground into cement at approximately 225 deg. F., of which a 13 deg. rise occurs in the secondary mill.

Grinding Layout

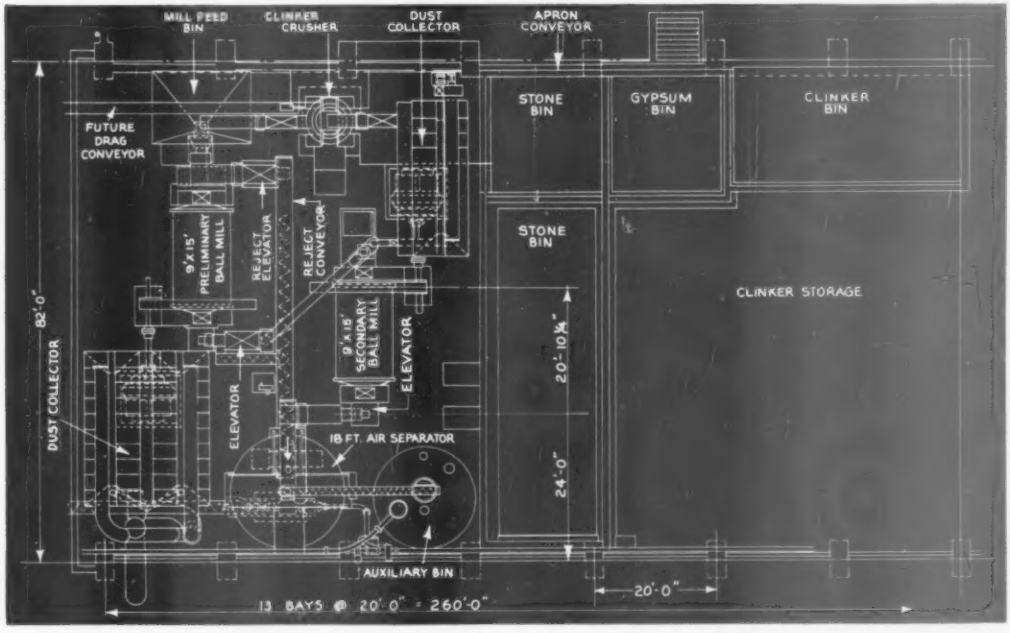
The plant has five direct-fired (coal) rotary kilns in operation, three of which are 10 x 150 ft. and the others 8 x 10 x 160 ft. None have clinker coolers and they discharge clinker into covered storage. A new 10-ton overhead Bedford crane with 3½-cu. yd. bucket, travelling an 80-ft. span, handles and turns the clinker in storage and also is the means of filling clinker and gypsum bins adjacent to the new clinker grinding mill and those from which the old grinding mill is fed as well. There are necessarily variations in the clinker temperature as supplied the finish mill department but 150 deg. F. is probably the maximum figure. A rail hopper was provided in the new layout whereby clinker from outside storage can be discharged to a belt conveyor for delivery into the main clinker storage area.

Paralleling the clinker and gypsum feed bins is a 30-in. Jeffrey leakproof apron conveyor over which clinker and gypsum in required proportions are delivered into the new mill building. Rate of feed of clinker on to the apron conveyor is regulated by a 30- x 42-in.

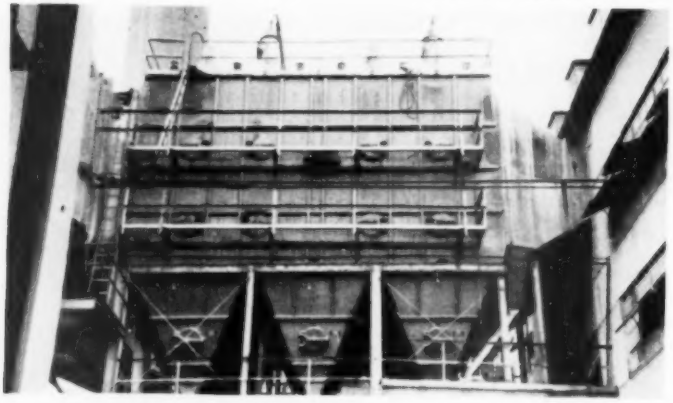
Crusher for reducing clinker before it is fed into grinding circuit

Jeffrey Waytrol on a movable car and the gypsum rate of flow is controlled by a 12- x 30-in. Waytrol. A third unit has been installed which can be used in case it is desired to blend different clinkers.

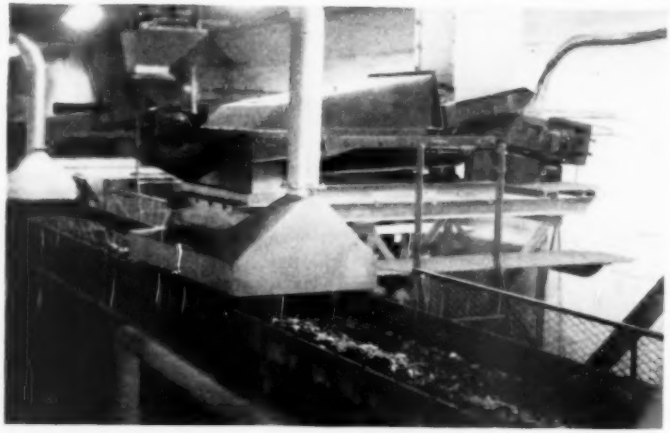
Clinker and gypsum, as proportioned, are elevated and put through a 4-ft. Symons cone crusher, direct-driven by a 175-hp. motor, for reduction to ½ in. top size. The crusher is run intermittently and its product elevated to a 75-ton preliminary mill



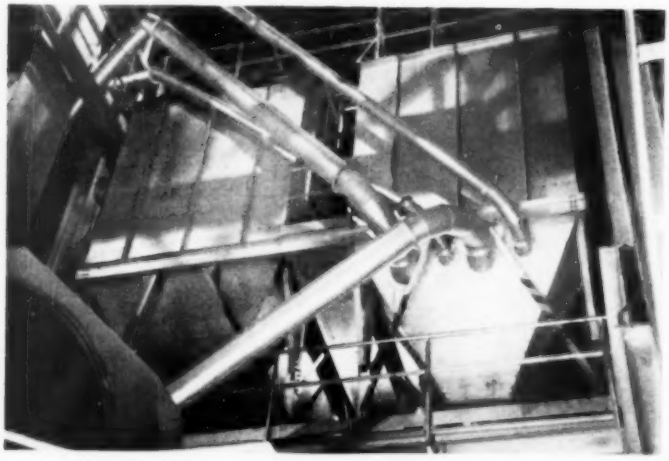
Arrangement of new two-stage clinker grinding department of great flexibility



New electrical precipitator installation for collection of dust from stack gases



Clinker and gypsum, proportioned by these feeders, are elevated and put through a clinker crusher



One of two dust collectors. This one vents grinding mills and bleeds air for cooling into air separator

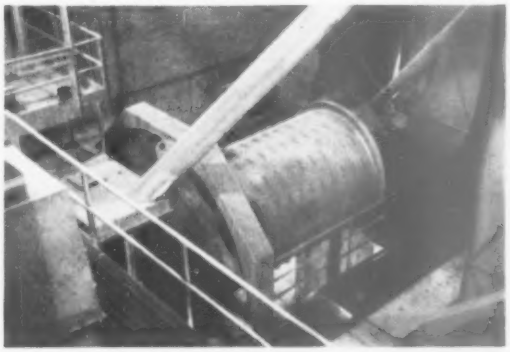
feed bin. The preliminary mill carries a charge of 48 tons of $3\frac{1}{2}$—$1\frac{1}{2}$-in. forged steel grinding balls, and is driven at 19 r.p.m. by a 600-hp. (4160 volts) synchronous motor through Falk coupling. Feed into the mill is automatically maintained at a constant rate by a Hardinge Feedometer and the stream is put into the mill by an integral drum-type of mill feeder.

Product of the preliminary mill is elevated and then spouted into the feed hopper for the secondary mill from which a screw flight feeds into the mill. A Bin-Dicator on this feed hopper completes an electrical circuit to sound a warning, in the event material might sometime build up in the hopper due to mill stoppage. This mill carries a charge of 48 tons of $1\frac{1}{4}$-in. Concavex grinding media and has a drive identical to that on the preliminary mill. Its product is elevated and fed to the mechanical air separator by screw conveyor.

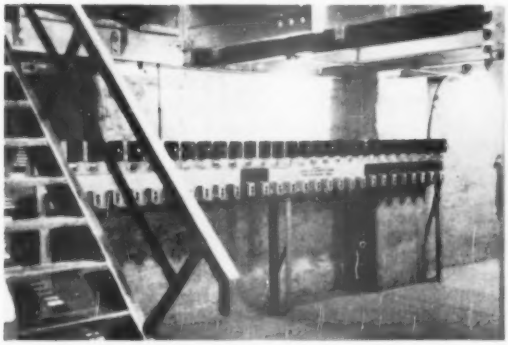
A 150-hp. motor drives the air separator through V-belt. Product of the air separator drops by gravity into the feed hopper for a 10-in. F-K pump for delivery into cement silos. The pump has a 150-hp. direct motor drive and its compressor a 200-hp. drive. Rejects are dropped to floor level and a 24-in. enclosed screw conveyor driven by a 30-hp. motor at present returns the rejects to the feed end of the preliminary mill for elevation into the feed hopper. Alongside the air separator, a circular steel bin has been erected as a means by which open-circuit ground cement containing additives, or other product, may be blended into the mill stream. A Fuller Airlift of the type for feeding dry materials into rotary kilns is the method used to raise and regulate the flow of materials from this bin into an overhead horizontal screw conveyor which discharges into the air separator.

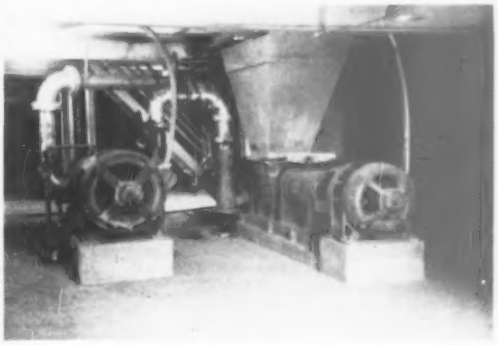
The entire building is of steel and reinforced concrete construction, and adequately served by dust collectors. There are two Northern Blower Co. bag-type collectors, one to collect clinker dust and a second of two units to collect the dust which can be fed the cement pump. The latter collector air-sweeps both grinding mills and bleeds air into the air separator to cool the circulating material. It is rated at 19,000 c.f.m., and the division is 3000 c.f.m. to air sweep each mill, 5000 c.f.m. into the air separator, 2000 c.f.m. for the blending bin, 1500 c.f.m. for each of three bucket elevators and 1500 c.f.m. for the cement pump and related conveyors. A 40-hp. motor drives the fan through V-belt and a screw conveyor transfers the dust collected to the hopper feeding the cement pump.

The other collector is driven by a 20-hp. motor through V-belt and is rated 9000 c.f.m. divided (1) 1500 c.f.m. for the clinker proportioning feeder, (2) 1000 c.f.m. for the gypsum



Preliminary 9- x 15-ft. ball mill and its 600-hp. synchronous motor drive, left. Right: Secondary 9- x 15-ft. ball mill, showing spout through which it receives feed from elevator carrying output of preliminary mill





Control station, left, with starter switches for all units in new finish mill. Right: Finished cement pump installation with its rotary compressor

feeder, (3) 2000 c.f.m. for the clinker crusher, (4) 1500 c.f.m. for the mill feed bin and (5) 1500 c.f.m. for each of two bucket elevators. A screw conveyor is the means of transfer of the dust to a spout down to the secondary mill feeder box. All elevators are Link-Belt, totally enclosed with bearings outside the casings, and the motors are largely Allis-Chalmers. Storage for finished cement is 225,000 bbl. in concrete silos.

Kilns

Installation of a new 10- x 150-ft. welded Allis-Chalmers kiln was not to increase capacity but to replace two old 7- x 100-ft. kilns. It has a $\frac{3}{8}$-in. pitch, is direct-fired with coal by a Raymond bowl mill and is lined with 9 in. of 70 percent alumina brick in the hot zone followed by lining of 6-in. ordinary fire brick with $2\frac{1}{2}$ in. of insulating block for the rest of its length. Drive is a 60-hp. motor. The kiln is fed by a Fuller Airlift constant head feeder which has its feed screw speed synchronized with the kiln speed which has four adjustments. One of these feeders has been in operation successfully for $2\frac{1}{2}$ years on one of the other kilns. Kiln speeds are usually held constant and the rate of coal feed and draft varied to conform.

Waste Heat Boilers

When the new kiln was installed, a new B & W single-pass, 3-drum vertical tube waste heat boiler and economizer, with a Western Precipitation Corp. Cottrell precipitator was installed in connection with it. At the same time, similar boilers and dust collectors replaced a single boiler setup which served the two adjoining 10- x 150-ft. kilns. Draft regulation had always been a problem in operating a single boiler in connection with more than one kiln and each of these kilns is now operated for individual control of draft in order to attain optimum firing conditions. The company has found its most economical practice based on its experience to operate kilns for efficiency in the manufacture of clinker and prefers not to burn excess fuel for the purpose of making extra steam available to generate electrical power.

The boilers are much more efficient than the older type and, being of single phase design, the drop in draft through a boiler-economizer unit is only 2.6 in. of water as compared to 6 in. previously. Exit gases are drawn through the boiler and then the economizer at the rate of 80,000 lb. per hr. from each kiln. Gas temperatures are dropped from 1600 deg. F. to 600 deg. F. through the boilers, and to 380 deg. F. through the economizers. Design capacity is 20-22,000 lb. of steam per hr. per boiler and the boilers are designed to operate at 250 p.s.i. head pressure. However, in order to conform with the characteristics of the older boilers still in service with the other kilns, the operating pressure is held to 165 p.s.i. at the boiler, which delivers 155 p.s.i. at the steam turbines in the power house. Temperature of steam is 550 deg. F. at the boiler nozzle. The power plant consists of General Electric, Westinghouse and Allis-Chalmers steam-turbine-generating units rated at 2500 kw., 3000 kw. and 1000 kw., respectively.

Boilers and economizers are under suction and the induced draft fan for each kiln is on the inlet side of the Cottrell precipitator. Exhaust from all three kilns is through a single 10- x 200-ft. common stack, which is of sufficient height to keep the dust collector under suction. Since dust-laden

(Continued on page 174)

Flexibility

Doubles Cement Capacity in Montana

Ideal Cement Co. installs additional kiln at Trident plant and makes important grinding changes for greater capacity and flexibility

By J. C. ANDREWS*

THE IDEAL CEMENT CO., Denver, Colo., has recently completed improvements at its Trident, Mont., plant, which have more than doubled the capacity of this dry process plant over what it was three years ago. The territory served by this plant was somewhat slower in expanding its portland cement requirements than nearly every other section during and immediately after World War II. Consequently, the plant was one of the last of the Ideal system to be completed in the company's huge expansion program undertaken and now practically completed since the end of the war. At the present time this plant is keeping ahead of the increased market requirements and will be able to continue to do so even in the face of the ambitious plans under way by the Bureau of Reclamation.

The first steps were taken late in 1946 to meet the anticipated increase in demand from this plant. At that time, the raw grinding capacity was augmented by the installation of an additional 8- x 5-ft. ball mill and a 7- x 22-ft. Allis-Chalmers Compeb Mill. This addition resulted in balancing the raw capacity with the added clinker-burning capacity already installed, allowing continuous operation of the three kilns, and resulted in an approximate increase of about 50 percent to the total output. At this time the principal production units in the grinding department consisted of six 6- x 6-ft. primary ball mills and six 6-ft. 6-in. x 22-ft. tube mills in addition to the Compeb and 8- x 5-ft. ball mill just mentioned. The ball mills were and still are closed circuited with Hum-mer 4-ft. type 42 single-deck vibrating screens.

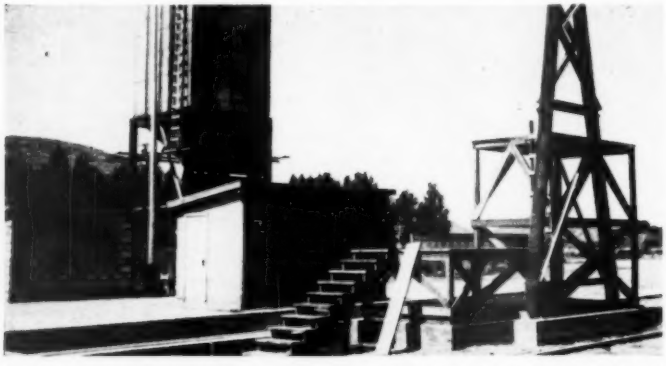
Early in 1948 construction was begun to again increase the capacity of the raw and finish grinding departments to take care of the increased requirements due to installation of an additional kiln.

The Compeb mill originally was installed as an open circuit mill, but has now been supplied with a 14-ft. Raymond double-whizzer mechanical air separator. The original installation of the six tube mills consisted of two mechanical air separators, each closed circuited with three tube mills. An additional 16-ft. dia. Sturtevant separator has been installed, each separator now being closed-circuited with only two tube mills. The final change was the substitution of 8- x 5-ft. ball mills for the remaining 6- x 6-ft. mills.

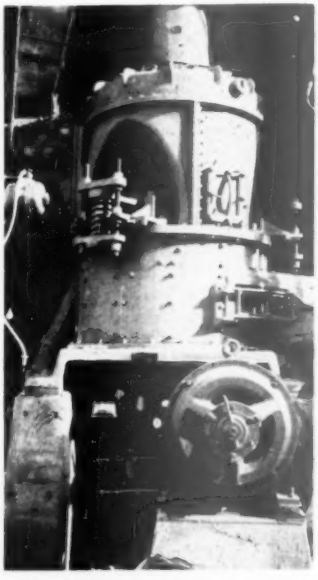
This arrangement gives great flexibility to the grinding department. One of the ball mills can be used for either raw or finish grinding. This mill is used intermittently for both purposes depending upon the urgency for producing kiln feed material or cement. The Hum-mer screens can be changed readily for larger or smaller size openings which will vary the size of feed to the tube mills and therefore permit proper balancing of the output of the two circuits.

The Compeb is also a dual-purpose mill. When operating all four kilns, this mill is used for raw grinding. If kiln feed storage bins are full it can be changed over to finish grinding with no lost time except for grinding the mill out and making minor separator changes. This Compeb mill can also be fed rock direct from the dryers, rock from the primary grinding circuit, clinker direct from the kilns or storage, or clinker which has been put through the primary ball mills. This flexibility allows the primary mills to operate at all times without lost time for want of bin space on the secondary or finishing side in the event of necessary repairs to the tube mills or the Compeb. More of the load

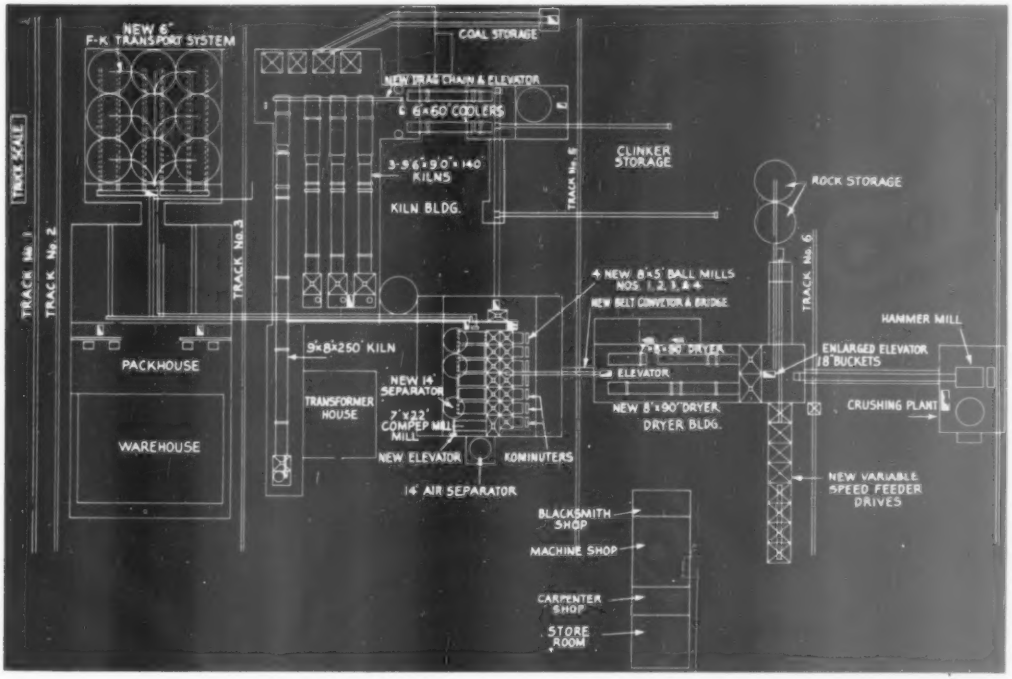
*Chief Production Engineer, Ideal Cement Co.



Bulk truck-loading scale and hopper in background. Track bulk loading platform and track scale pit in foreground. Track scale and cement pump piping not yet completed



New coal pulverizer used for firing 9- x 8- x 250-ft. kiln



Layout of plant which has been increased to 3500 bbl. per day capacity

is merely shifted from the primary to secondary circuits or vice versa as the need arises.

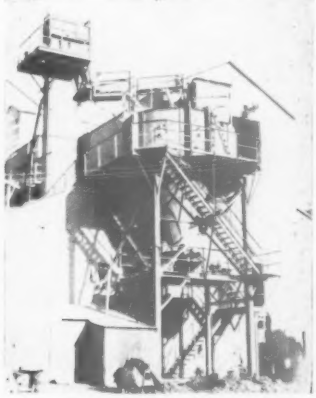
An interesting point in regard to the ball mills is the fact that at the time the 8- x 5-ft. ball mill was installed with the Compeb, the company had a surplus No. 85 wet-type Kominuter with the usual high level discharge. This mill was installed as a replacement for one of the old No. 66 dry Kominuters with no alteration of any kind of the discharge head. It has out-performed a similar unit designed for dry grinding with the periphreal discharge operating alongside of it. When the remainder of the No. 66 Kominuters were replaced with ball mills, the high level discharge was incorporated into their design.

The additional raw capacity required the replacement of a 6- x 90-ft. rotary rock dryer with an 8- x 90-ft. rotary dryer. This dryer was designed by the Ideal Cement Co. and built at a nearby machine shop and foundry in order to expedite delivery. The additional two feet in diameter has resulted in nearly doubling the drying capacity, using the same stoker and very little extra fuel.

The recently completed installation of a 9- x 8- x 250-ft. rotary kiln in addition to the three 9-ft. 6-in. x 9-ft.

(Continued on page 192)

The Trident cement plant is picturesquely located, in mountainous country and along the Missouri river



Double-whizzer air separator, 14 ft., installed in closed circuit with compartment mill

Progress in Firing Rotary Kilns

Recent progress in instrumentation and performance summarized for particular installations. Oxygen analyzer a key instrument in firing kilns

By C. H. BARNARD*

WIDE-SPREAD use of rotary kilns in the manufacture of portland cement, lime, dolomite and other products has resulted in the development of many types of equipment especially adapted for this type of service, and designed to increase production and reduce operating costs. One of the most inexpensive developments from the standpoint of capital expenditure required is suitable instruments and automatic control equipment. The expenditure of a relatively small amount on a suitable instrument or controller will frequently result in immediate savings many times as large as the original investment. As in all progressive industries, this fact is becoming more and more appreciated, and yet today relatively few rotary kilns are equipped with the necessary instruments and control for optimum operation.

This situation is not because operators of rotary kilns are reluctant to accept advances, but rather because of the problems involved in adapting equipment for the special conditions encountered. For about 20 years, kiln operators and manufacturers of instruments and controls have been striving to develop the necessary equipment, but it is only within the past two or three years that complete instrumentation, suitably designed for kiln service, has been available.

The advantages to be gained by the use of instrumentation are manifold: fuel consumption can be held at a minimum, product quality can be maintained consistently and uniformly high, down-time can be markedly reduced, maintenance expense considerably reduced, and less experienced operators may be employed without danger of high operating costs or reduced production. All of these advantages have a direct dollars and cents bearing on the cost of the finished product, and with competition growing keener every day, lower cost of the product, consistent with high quality, is uppermost in the minds of all operating executives.

During the 1920's most rotary kilns were fairly short. They were operated under natural draft and fired with either oil or gas, or with pulverized coal from a bin system. Waste heat boilers were frequently installed in an effort to reduce operating costs, sometimes successfully, but many times not. Instruments were used sparingly; they required a great deal of skilled maintenance which was not generally available, and added very little of value to the plant.

The depression of the early 30's brought about a keen desire to reduce operating costs to an absolute minimum, and at about the same time specifications for quality began to be more stringent. In their search for improved methods, many aggressive plant operators turned to instruments and control as one means of accomplishing the desired results.

More experienced operators had learned that more consistent results could be obtained if the draft in the kiln hood was maintained fairly constant. This observation led to the use of draft gages, and a little later on to the use of hood draft control, by which the kiln exit damper was regulated to maintain the draft in the hood constant. Frequently, hood draft recorders were installed as a means of keeping a permanent record of the operation. This equipment paid handsome dividends, since it kept the "hot spot" closer to the desired point and stabilized the effect of varying stack drafts. This resulted in considerable saving in fuel, as well as a more consistent product.

The development of radiation pyrometers at about this same time permitted the operator to keep a closer check of the temperatures at the firing end, and permitted better fuel regulation. Automatic control of fuel was a natural outgrowth of this development, and further improvements were made in kiln operation by its adoption.

Test work conducted by several engineers indicated that feed end draft control would further stabilize the operation of the kiln, and many of the hood draft controls were reconnected to hold the draft at the feed end constant, rather than the hood draft. The variation in the resistance of the kiln, caused by ring formation or quantity of material in the kiln, had the effect of varying the air flow considerably when the hood draft was maintained constant, and while this same effect was also prevalent when maintaining a constant feed end draft, it was to a considerably less degree. It did, however, tend to make the hood draft less stable and increased the possibility of air infiltration or a burned seal ring.

This investigation led to a demand for better control of the flow of air, and the introduction of forced draft fans about this period permitted the use of air flow control and hood draft control combined. This combination was a great improvement over equipment previously used, as it combined the advantages of hood draft control with a steady air flow. This permitted maintenance of a consistent hot spot, reduction of air infiltration around the firing end, and production of a more consistent product, all of which had not been simultaneously obtainable before.

With the war approaching, the more up-to-date rotary kilns were provided with equipment of this type: a radiation pyrometer, generally recording, controlled the fuel; an air flow controller regulated the forced draft damper; and the hood draft control regulated the kiln exit damper.

Some attempts were made during the late 30's to control fuel at a constant rate and to adjust the speed of the kiln to maintain a consistent temperature at the firing end. This was partially successful, but the difficulty of obtaining precise speed control of the kiln, without a large expenditure, generally resulted in a "too much or too little" type of control.

During the war years tremendous strides were made in the art of measuring and controlling, and yet rotary kilns were not able to take advantage of these advances. Instruments and controls in tremendous quantities were required for aviation fuel plants, synthetic rubber plants, the armed forces, and the development of the atomic bomb. The cement and lime industries very ably met the demands placed on them by the war without the need for greatly expanded facilities, with the result that priorities for materials

*Application Engineer, Bailey Meter Co., Cleveland, Ohio.

were quite low, and little progress was made.

With the end of the war, greatly improved types of instruments and controls were available, as well as many entirely new instruments completely developed and thoroughly tested. It then remained for the application of this improved type of equipment to be worked out for rotary kiln service.

Oxygen Analyzer

As far as the operators of rotary kilns are concerned, one of the outstanding developments of the war years was a satisfactory oxygen analyzer for continuously analyzing the exit gases. Work on oxygen analyzers had been started prior to the war, but little work was done to make them suitable for rotary kilns. It has long been recognized by most engineers that because of the large liberation of carbon dioxide in most rotary kiln processes, oxygen alone remained the one constituent of flue gases which was an accurate indication of excess air. Since controllable losses in any combustion process are largely the function of the excess air supplied for combustion, it is fundamental that accurate control of excess air is essential for the most economical operation.

While automatic oxygen analyzers had been manufactured in considerable quantities during the war, special problems associated with rotary kilns had to be worked out before satisfactory installations could be made. The heavy dust concentration presented a difficult problem since all types of gas analyzers require a clean, dust-free sample. The dust inherently present in the atmosphere around nearly all rotary kilns required equipment which would not be harmed by the dust, and which would not be adversely affected by the sometimes highly corrosive gases emitted from the stack.

Because of the long path of flame travel in a rotary kiln, it had been learned that, in general, kilns could be operated most economically with rather low quantities of excess air, and this led to the discovery just prior to the war that many kilns were operated so close to the theoretical point that many times large quantities of unburned gas would be emitted from the stack. These large quantities of unburned gas represent a very large loss of fuel, and cannot be tolerated in any degree if high efficiency is expected.

Continuous high speed automatic combustibles gas analyzers were also developed during the war, but presented the same problems as the oxygen analyzers when adapting them to kiln service.

Fig. 1 represents combustion characteristics on a typical kiln and it can be seen that a very narrow range of excess air is permissible for maximum economy. On one side of this narrow range, losses from increased temperature and increased quantities of heated air passing from the stack prevent high economy, while on the other side unburned gases contribute greatly to the total losses.

A similar curve for any kiln may be drawn by operating for periods of say a full day, at several different values of excess air, and keeping accurate records of production and fuel consumption. It presents the simplest and most accurate means for determining the optimum excess air.

Sampling Gases

About two years ago a suitable sampling system was devised by our company for rotary kiln service, which was able to operate for extended periods without manual attention, and yet give a very rapid response to changes in the oxygen content of the exit gas. Fig. 2 shows schematically a typical installation of an oxygen analyzer and a combustibles analyzer

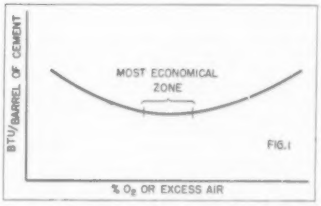


Fig. 1: Typical combustion characteristics for a cement kiln

connected to a common sampling system, and transmitting the analyses electrically to a two-pen recorder located at the firing end where it is of the most value to the operator. Actual tests on many rotary kilns show that this arrangement has a total time lag of approximately one minute from the time a change takes place at the burner until it is reflected in the record. This time lag includes total time for the gases to sweep the entire length of the kiln, to be withdrawn by the sampling system, scrubbed and delivered to the analyzers, analyzed, and the analysis transmitted to the recorder. This high speed of response shows up small cycling variations which cannot be detected with equipment of slower response time. Many of these small cyclic variations contribute appreciably to decrease in economy, and their detection and elimination is of utmost importance in obtaining optimum performance.

The sampling system employed consists of a sampling tube installed at an angle as shown (Fig. 2) and projecting into the shell of the kiln so as to eliminate air infiltration from the feed end seal ring. The sample tube is of the water spray type, which washes away considerable quantities of dust from the gas before it enters the sample tube. Excess water is vaporized in the high temperatures prevalent at the kiln exit and passes up the stack.

Wash water is introduced in the inductor installed immediately at the exit of the sample tube as shown, and washes the sampling line free of all dust which would settle and plug the line. A combined water aspirator and scrubber assembly thoroughly cleans the dust from the sample, and flushes it to drain with the wash water from the separator trap. A clean, saturated, pressurized sample is then delivered through final filters to the individual analyzers. A typical sampling tube installation of this type is shown in Fig. 3.

The analyzers employed are of the catalytic combustion type, which insure the highest speed of response consistent with simplicity and a minimum of maintenance.

Performance Records

Many installations of equipment of this type are now in continuous service and, in all cases where accurate

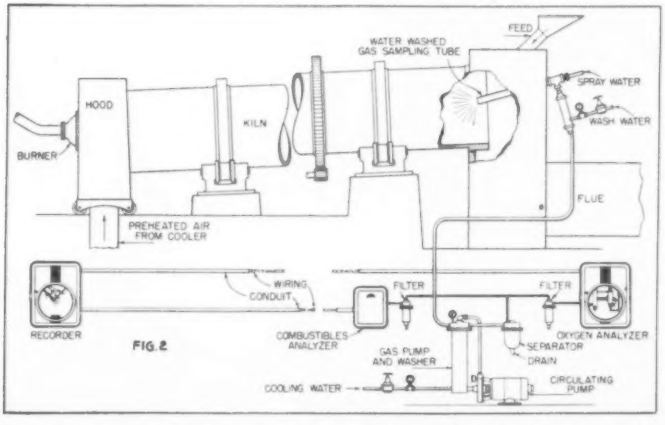


Fig. 2: Diagrammatic layout of oxygen and combustibles recorder installed on a rotary kiln

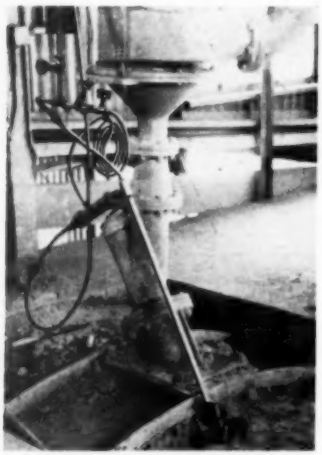


Fig. 3: Spray-type sampling tube installation as applied to a rotary cement kiln

figures are available, the investment in the equipment has been paid off by fuel savings alone within a very few months. In one installation the intelligent use of an oxygen analyzer resulted in an increased capacity from a large gas-fired kiln of approximately 20 percent, without any increase in the fuel consumed.

This plant conducted extensive tests on the kiln, similar to those described above, to determine the most economical operating point, and the operators were then instructed to maintain the oxygen as close to that point as possible. A typical chart from that plant is shown in Fig. 4, and it will be noted that the record is fairly consistently between 2 and 2½ percent oxygen, which was the range determined to be the most economical for that particular kiln.

On another installation consisting of four rather old, short, wet process kilns fired by pulverized coal, the installation of oxygen and combustibles analyzers permitted a reduction in fuel from 145 to 111 lb. of coal per barrel of clinker, and at the same time permitted the production of a more consistent quality.

A third installation, also equipped with an oxygen and combustibles recorder, resulted in a reduction from 140 lb. of coal to 120 lb. of coal per barrel of clinker. A typical chart from this plant is illustrated by Fig. 5. This chart was selected to show several different types of operation. From 11 a.m. to 1 p.m. it will be noted that the oxygen content was being held very low, with a resulting increase in the quantity of combustibles being present. From 4 p.m. to 5 p.m., the oxygen content was held quite low, and yet during this period the combustibles content was maintained at zero. This represents optimum conditions for this particular kiln. The period from 1 p.m. to 4 p.m. shows too much excess air; a condition which causes unnecessary stack losses.

Like any piece of unfamiliar equipment, immediate results cannot be expected, and it is necessary to train the operators in the intelligent use of the equipment before optimum performance will be obtained. A typical example is a recent installation on a new gas-fired cement kiln, as illustrated by Fig. 6. This chart was taken within a few weeks from the time the kiln was first placed in service, and the extreme swings in the oxygen content of the exit gases, together with extended periods of very high or very low oxygen content indicates lack of experience on the operator's part. Prior to the installation of the oxygen analyzer, the kiln was assumed to be operating fairly satisfactorily, and the very erratic record prompted an investigation which will undoubtedly improve results at this plant considerably. The results of this investigation, and the recommended changes, are not available at this time.

Reports from several plants indicate savings in fuel alone of from 5 percent to as high as 25 percent within a few weeks after the installation of the equipment.

Coupled with the improved types of instruments and controls previously used, the high speed automatic gas analyzers have rounded out the lines of equipment available for rotary kiln service and have permitted the continuous operation of kilns at peak capacity and with maximum economy. A few complete installations are in service today, a typical example being that shown by Fig. 7, which illustrates a control panel for two coal-fired rotary lime kilns.

Advantages of Control

In addition to fuel reduction, many other operating improvements have been definitely attributed to instruments and controls. Maintenance of the kiln lining has been considerably reduced by the maintenance of consistent temperatures and the elimination of temperature shock resulting from sudden changes in temperature. This not only results in a direct labor and material saving, but also reduces down-time of the kiln, and permits maximum yearly production.

Product quality can be more easily maintained with automatic control, since control is on the job every second of every day, and detects changes in conditions before they would be noticed by the operators. This reduces the amount of rejected product, and also lowers grinding costs by maintaining a more uniform type of product.

The formation of rings, the nemesis of all kiln operators, can be ma-

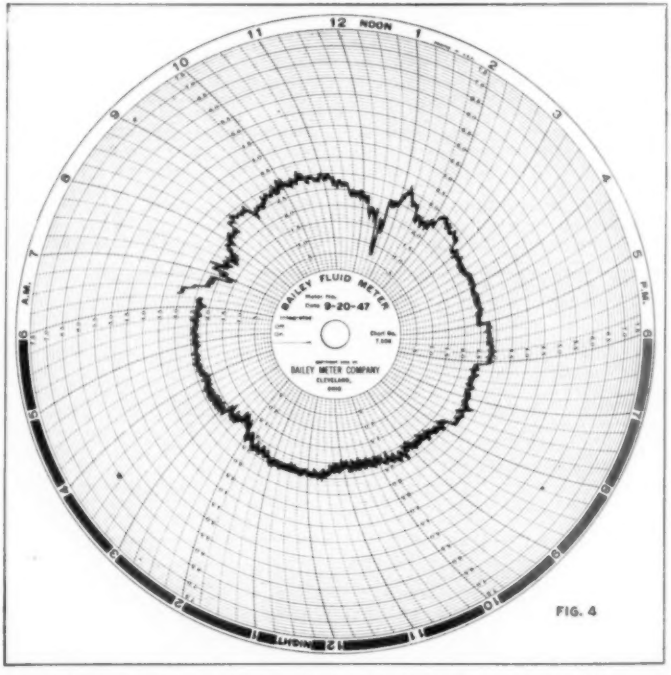
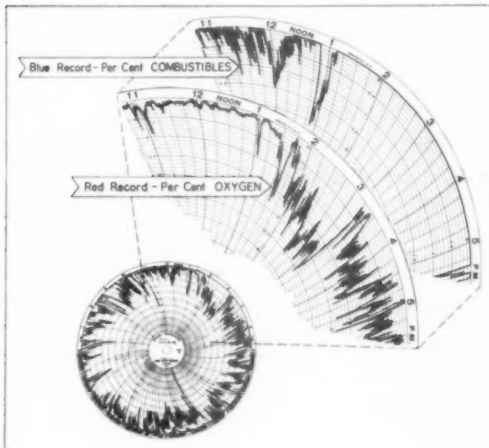


Fig. 4: Chart showing typical oxygen analyses as recorded for a kiln where 2—2½ percent O_2 was considered the desirable operating range



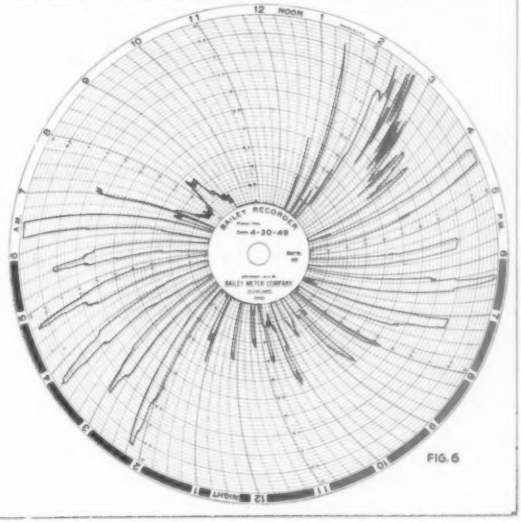


Fig. 5: Typical record of oxygen and combustibles for a short, pulverized coal-fired kiln. Fig. 6: Oxygen record for a long gas-fired cement kiln, showing variations due to operator's inexperience

terially reduced and in many cases practically eliminated by a properly coordinated and adjusted control system.

Since most of the "thinking" is done by the instruments, more economical use of the operators' time can be made since they do not have to be continually watching for all the variables which may enter into the operation.

Future Instrumentation

While tremendous strides have been made since the end of the war, and several good installations are now in service, some work remains to be done in the application of automatic control from oxygen measurement. A few plants are now under construction which will be equipped with a complete coordinated control system, utilizing the latest developments in instrumentation, and will have fuel-air ratio maintained within precise limits by an oxygen controller. A typical example of such an installation is that shown by Fig. 8 which consists of an oil-fired lime kiln. Primary control of this kiln is from lining temperature as measured by a radiation pyrometer which controls oil flow to the kiln, and regulates the position of the forced draft damper. Changes in lining temperature thus change both fuel flow and air flow simultaneously, and by approximately the proper amount. Oil flow, as measured by an area-type meter, the most recent development in heavy oil flow measuring devices, records on the same chart with the combustion air flow-meter, which is of the orifice type. A ratio controller installed in this instrument modifies the position of the forced draft damper to maintain the oil flow-air flow ratio at the proper value. An oxygen analyzer will analyze the exit gases, and further readjust the forced draft damper to maintain the most economical excess air. A hood draft controller will regulate the kiln outlet damper to maintain a substantially balanced

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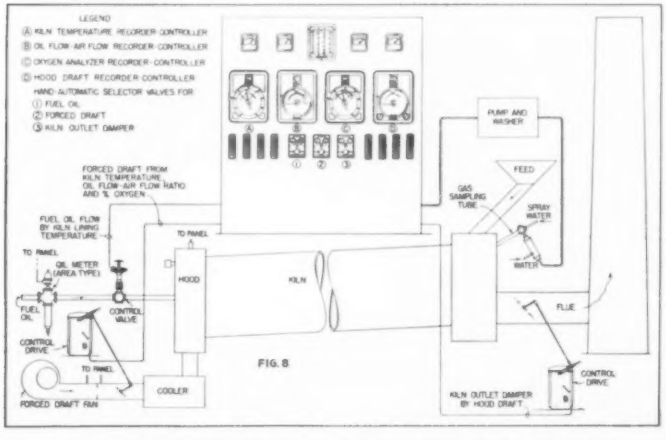


Fig. 8: Complete control system to be installed on a long oil-fired rotary lime kiln

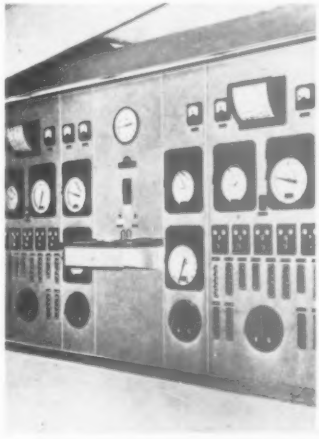


Fig. 7: Control panel for two coal-fired rotary lime kilns which are highly instrumentalized

Production

Lone Star Expands In Texas

Dallas plant installs new long kiln, air-quenching clinker coolers, improved proportioning methods and increased slurry facilities

DEMANDS FOR portland cement continue to press the capacity of Texas mills to the limit, and the outlook for the years ahead points to a rapid development of the Southwest and acceleration of the rate of building. These economic factors are reflected in the plant expansion and improvement program just completed at the Dallas, Texas, plant of Lone Star Cement Corp., whereby its potential capacity has been increased by more than 25 percent. Greater efficiency and better control of quality were also objectives of the program which we consider herein.

Production of portland cement clinker has been increased in excess of 2100 bbl. per day since installation of a new 10- x 11- x 275-ft. rotary kiln (No. 4); and additional storage of raw materials and slurry, and enlargement of the raw grinding department were completed to accommodate the increased demands. Individual inclined-grate, air-quenching clinker coolers of improved design were installed in connection with all four kilns principally for their contribution to more controlled kiln firing conditions and fuel efficiency. To complete the current building program, accurate methods of proportioning the separate raw materials were incorporated, for quality control and to effect more uniform burning conditions through the kilns. Early in 1948, a modern and dustless packhouse had been completed, which is almost an exact duplicate of the facilities at Birmingham, Ala. (See ROCK PRODUCTS, September, 1948, pp. 82-87).

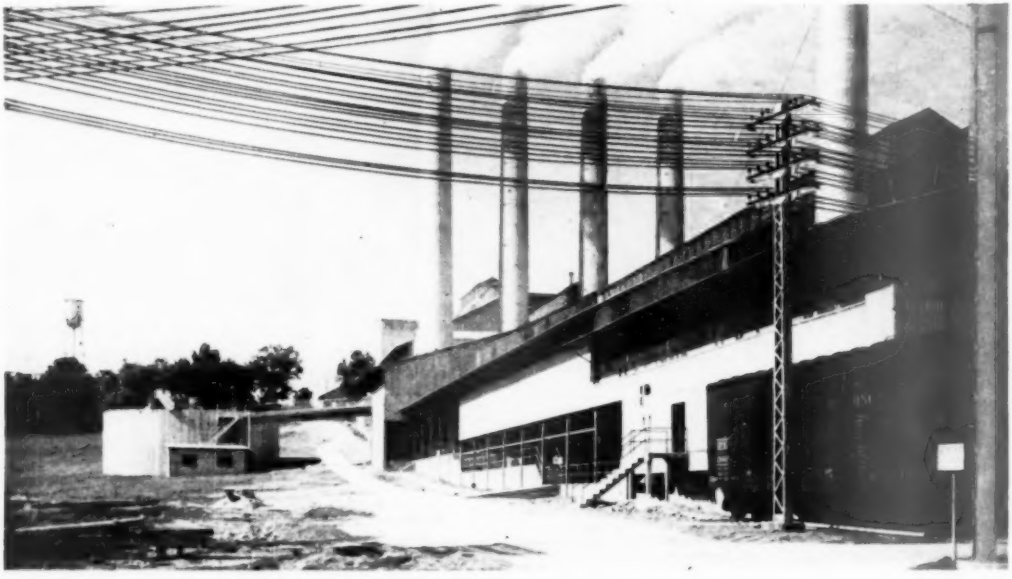
Plant Layout

The Dallas plant is a wet process mill, with three 8- x 9- x 11- x 275-ft. rotary kilns in addition to No. 4, and produces standard, high early strength and masonry cements. It is one of few cement plants that is absolutely straight-line flow in design, with all production departments, the quarry and the packhouse on a single longitudinal axis. The plant is one of the neatest and cleanest in the industry, and there is no visible evidence anywhere in the vicinity that dust is escaping with the stack gases. There are no dust collectors for kiln gases; yet the stacks appear to be exhausting steam largely. Austin "chalk," the limestone which comprises the majority of the raw mix, has certain sticky characteristics when pulverized into slurry which apparently make it "non-dusting."

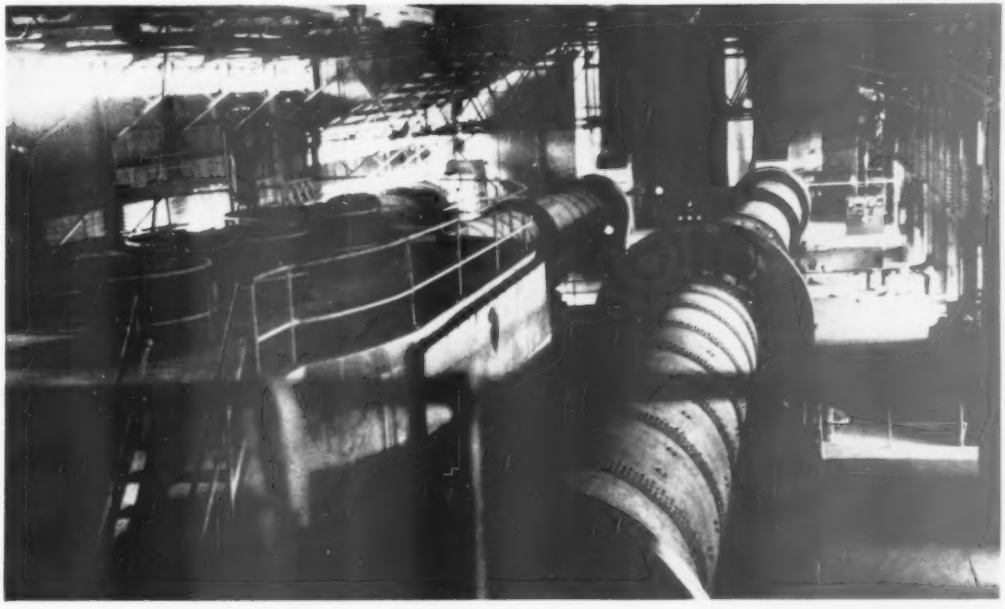
The layout consists of (1) the quarry, (2) narrow gauge railway haul to the crushing plant, (3) delivery of minus 1-in. stone and shale by belt conveyor into covered raw material storage, (4) belt conveyor withdrawal to the raw mill, (5) two-stage grinding into slurry, (6) pumping of slurry into correction tanks and then into kiln feed tanks, (7) the kilns, (8) air-quenching coolers, (9) direct conveying of clinker into silos, (10) closed-circuit clinker grinding and (11) pumping of cement into the stackhouse silos.

Raw Materials

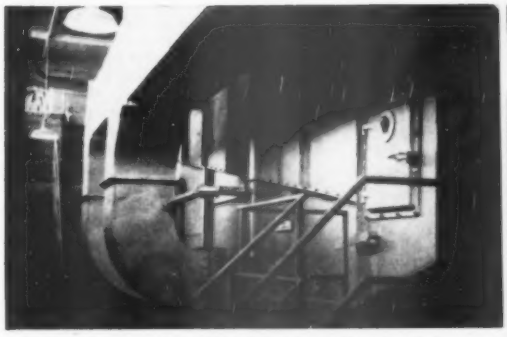
Austin limestone is 90-92 percent $CaCO_3$ and is considered a tough rock to crush but it is a non-crystalline rock that has good grindability and, as a result, power required for grinding is remarkably low. It is a type of stone that holds approximately 12 per-

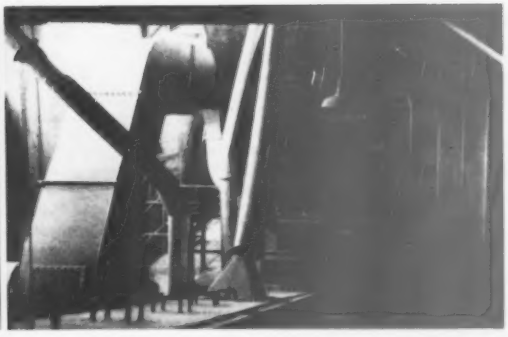


This view shows new 7500-bbl. slurry basin and kiln building extension for new kiln

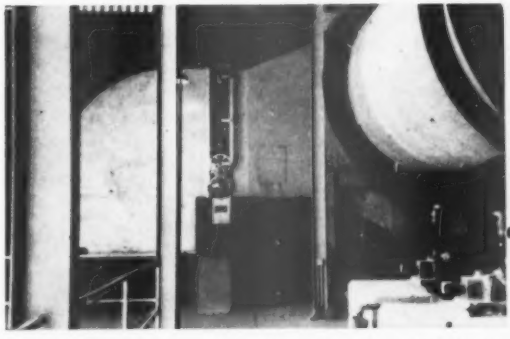


General view of kiln room

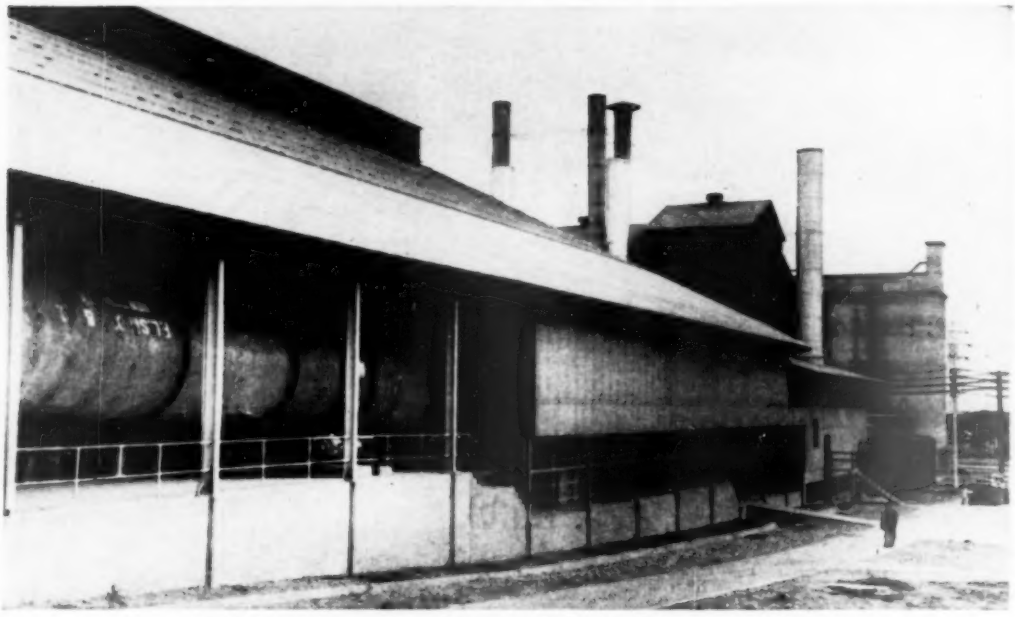




Side view, left, of one of the clinker coolers, showing air ducts; and, right, close-up of discharge end of clinker cooler. Note clinker breaker and piping to vent drag conveyor and to return dust



Louvre damper, left, on new kiln operated from burner's platform; and right, preliminary grinding mills in raw end, closed-circuited with slurry screens in producing minus 20-mesh tube mill feed



New kiln is shown in foreground of this plant view, looking toward firing end and stockhouse

cent moisture on the average and contains roughly 2 percent iron, 3 percent alumina and 4 percent silica with practically no magnesia. It overlays shale that is quarried alongside the limestone operation and which is roughly proportioned with the stone by volume in delivery to the crushing plant. Due to the high moisture, the raw mix comprises about 700 lb. of limestone plus shale, and silica sand which is added 2.4 percent by weight, per bbl. of clinker produced.

Limestone is quarried by blast hole drills and split-second delay blasting. Two 3½-cu. yd. 85-B Bucyrus-Erie electric shovels load into side-dump cars which are hauled to the crushing plant over 36-in. gauge rail by a 25-ton General Electric diesel-electric locomotive. Twelve cars of 7½ tons each comprise an average train, and the haul is about one and one-half miles in one direction with very little grade. Shale is loaded by shovel into separate cars, hauled three to a train by 20-ton Vulcan diesel locomotives.

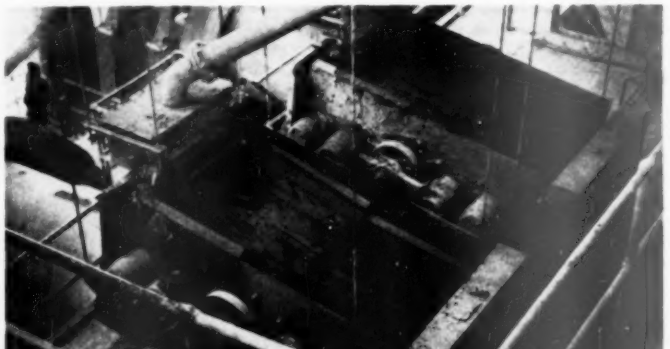
Practice is to dump one car of shale to every five of limestone into the crusher feed hopper in a simultaneous operation that roughly gives the required proportions. Sand is added later, when crushed limestone and shale are withdrawn from storage for transfer to the raw mill.

This is one of few cement mills that employs a single hammermill for single-pass reduction of quarry run stone down to grinding mill feed size. The unit is a 72- x 60-in. Dixie mill, which reduces the stone to 92-94 percent passing a 1-in. screen for direct elevation into rock storage bins.

Proportioning

Availability of raw material for kiln operation has been a limiting condition at this plant, so storage facilities for crushed limestone and shale have been increased from 5000 to 7500 tons by extension of the existing undercover storage area for greater reserve against failure to secure sufficient stone from the quarry. Storage consists of three parallel rows of 17 pockets, or bins, filled from overhead by belt conveyor and from which the stone-shale mix is withdrawn by 30-in. horizontal tunnel belt conveyors (3) for delivery to the raw mill. Several of the storage pockets are kept filled with limestone unmixed with shale, for the production of high lime slurry which is pumped into a high lime tank after grinding for blending.

New provisions for the proportioning of sand into the mix include a truck hopper and three 100-ton bins, each over one of the raw material belt conveyors. Sand is fed out over a Rex pan feeder which is actuated from a G. E. interval timer in circuit with a Merrick recording Weightom-



Two new slurry screens, closed circuited with new preliminary grinding mill. Tube mills below are fed the fines from trough below screens

eter with which each belt conveyor has been equipped. Sand is paid out at the rate of about 12 lb. for each bbl. of cement clinker produced; requiring two minutes of operation of the feeder for each five tons of stone. The Weightometer affords a continuous check on production. Sand used is 92-94 percent silica, 100 percent passing a 48-mesh sieve, and is dredged from the Trinity river and trucked to the plant on contract.

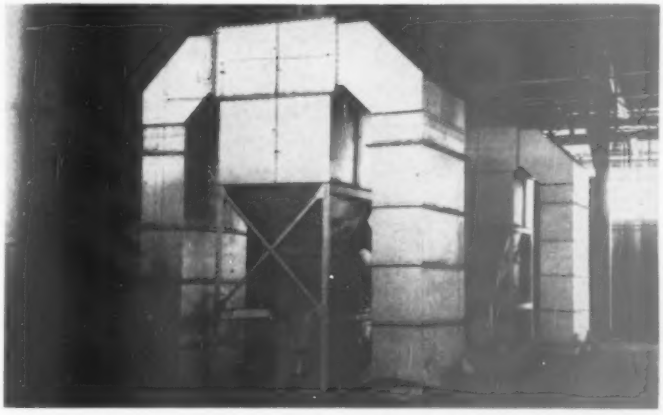
Raw Grinding

Slurry is pulverized to a fineness of 90 percent minus 200-mesh by two-stage grinding, consisting of kominuters in closed-circuit with slurry screens followed by tube-milling in open circuit. Capacity of the raw mill was increased by adding a third No. 8 kominuter in closed-circuit with two 4- x 6-ft. Ty-Rock F-300 slurry screens. The screens have .060 Ton-Cap wire and are operated at 20 percent circulating load in screening a slurry with 44 percent water. Oversize is elevated for rescreening and the throughs enter a feed tank from which the five original 5-ft. 6-in. by 20-ft. tube mills are fed a minus 20-mesh product. Until recently the separation was more near 8 mesh.

Addition of one kominuter and the feeding of finer material to the tube mills has increased capacity to 300 bbl. per hr. (clinker) of raw grind, sufficient for 4-kiln operation. The kominuters and the tube mills are each driven by 150-hp. electric motors. Open circuit grinding has possibly been a factor in holding down dust losses in the kiln exit gases. Power consumption for grinding slurry is only 2.5 kw.h. per bbl.

Slurry Storage

Until this year, slurry storage was limited to 6000 bbl., in four correcting basins and two kiln feed tanks of 1000 bbl. capacity each. A 66-ft. diameter by 25-ft. slurry storage basin of 7500-bbl. capacity was constructed this year to provide added reserve and for additional blending. The basin has a revolving bridge with double-type mechanical agitators and has 8-in. slurry circulating and transfer lines.

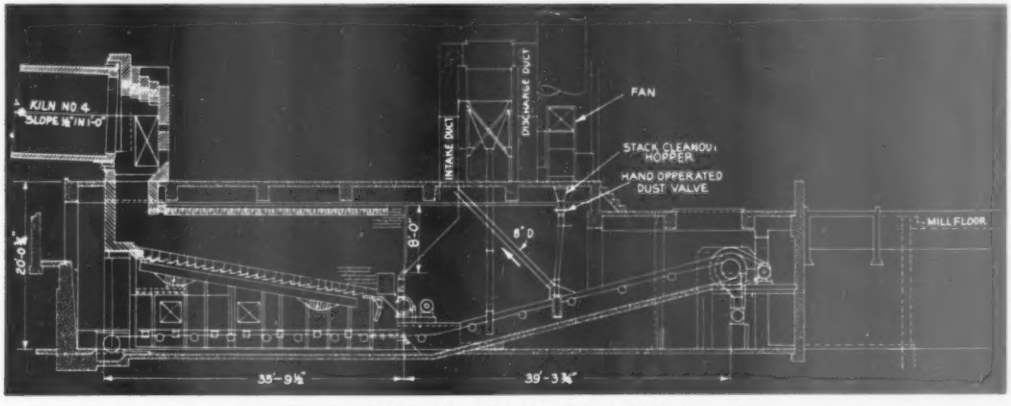


Two of cyclone-type dust collectors. Each clinker cooler has its own collector

Diesel-electric locomotive that hauls limestone from quarry to crushing plant

A new 6-in. Model C Wilfley slurry pump elevates the tube mill product into either of the 1000-ton correcting basins and, after blending and correction, the slurry is pumped into the new basin from which two new 6-in. type R Morris slurry pumps pump the slurry into the kiln feed tanks. The agitator drive is a 15-hp. motor and the bridge drive a 7½-hp. motor, through James speed reducers. The agitator shafts turn at 4.9 r.p.m. Principal function of the new slurry basin is to provide extra storage but the additional handling will be of benefit in blending and the attainment of more uniform chemical composition and water content.

Practice is to hold one correcting tank of high lime slurry to be blended with the regular run slurry which is usually maintained about two percent low in lime content. Sampling is done after a 2-hr. circulating period in blending. A continuous sampler in the feed box for tube mill product to the Wilfley slurry pump is the means of checking the chemical content of the slurry as delivered into the correcting



Layout of air-quenching clinker cooler with unit dust collector for new kiln

Air-conditioned office building and laboratories building just erected, is alongside kiln building

tanks. It is also a means of checking on the mix proportions of limestone and shale as delivered into storage from the crushing plant. Samples are analyzed at 2-hr. intervals. Minimum water content of the slurry as fed into the kilns is 43-44 percent.

Kilns

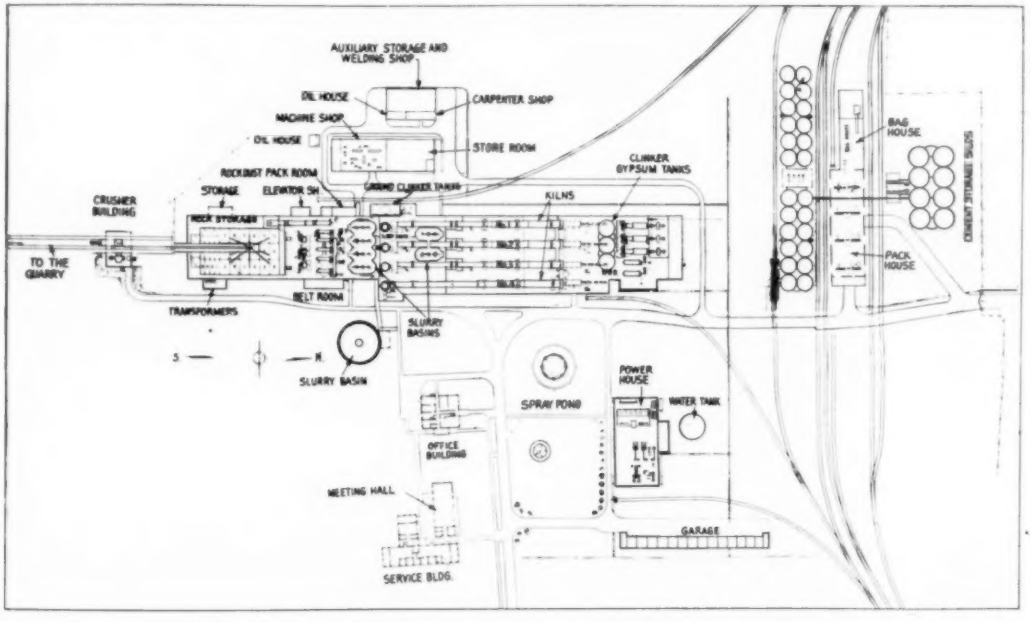
Each of the three older kilns, 8- x 9- x 11- x 275-ft., has an enlarged burning zone and restricted calcining zone. Production is 1400-1500 bbl. of clinker per day from each; the new kiln (No. 4) is 10- x 275-ft. with a 64-ft. burning zone of 11-ft. diameter and is producing 2100 bbl. per day. It is expected that that figure will be increased. Kilns are gas-fired and each is equipped with a new air-quenching clinker cooler. The three older kilns previously had rotary clinker coolers.

Kiln No. 4 is operated much like the other three but is more highly instrumentalized. It has a slope of ½ in. to the lineal foot and, like the others, is turned at 1 r.p.m. Lining consists of 6-in. refractory brick throughout its length, starting with 16 ft. of 40 percent alumina brick at the high temperature end, followed by 24 ft. 4 in. of 70 percent alumina brick, 22 ft. 8 in. of 60 percent alumina brick and then 40 percent alumina brick for the balance of its length. All the kilns have F.L.S. chain systems; on kiln No. 4 the chain section starts 11 ft. 6 in. from the back end and extends a distance of 49 ft. There are 6560 ft. of ⅝-in. chain and there is provision to extend the chain system an additional 11 ft. Its drive is a 75-hp. motor through Philadelphia gear but actual power input is 62 hp. Speed is synchronized with ferris wheel feeders to maintain a uniform rate of feed of slurry.

Each kiln has Smidth louvre draft control operated from the burner's floor through a Selsyn drive linkage and exhausts at 500-600 deg. F. through a dust chamber to its separate stack. These chambers are nothing more than reverse-flow expansion chambers where about three tons of dust per day are settled per kiln. Apparently that is about all the dust that is carried by the exit gases and is insufficient to warrant return into the kilns.

Clinker Coolers

The No. 4 kiln installation included a Fuller cooler, and, when this unit was in operation, Fuller coolers were installed to replace the old rotary coolers on kilns Nos. 1, 2 and 3. The engineering for the cooler installation, as



General layout of Dallas plant. Note straight-line flow from quarry to packhouse

prepared by Lone Star's engineering department, contains several new features in connection with cooler operation, as is illustrated on the drawing showing this installation.

Coolers are 10 deg. standard inclined Fuller coolers, No. 625 on kilns Nos. 1, 2 and 3; and No. 629 on kiln No. 4. These coolers are of a somewhat more liberal size than usual, providing a conservative air load through the grates, which is considered important for best operation.

The kiln hood is especially designed to make the most suitable connection between the cooler and the kiln for the secondary air, and it is well to note that, on kiln No. 4 which was an entirely new installation, the center line of the Fuller cooler is offset 18 in. from the center line of the kiln, so as to deposit the clinker on the center of the grates of the cooler. On kilns Nos. 1, 2 and 3, the coolers are on the same center line as the kilns, and proper opening for the discharge of the clinker is provided by means of some arches at the clinker inlet. These arches present a problem of maintenance and should be eliminated wherever possible by offsetting the cooler.

All the kilns are equipped with air-cooled discharge nose brick retainers of Lone Star's design. This kiln end is equipped with an air seal but arranged to admit a small amount of air around the nose end and has greatly reduced maintenance of kiln ends.

New slurry storage basin of 7500 bbl. capacity has mechanical agitator. Slurry is pumped to kiln feed tanks

The grates are driven by a 5-hp. Reeves varispeed motordrive with a 2:1 speed reduction. Bed speed is controlled automatically through a potentiometer controller which measures the temperature of the preheated air forced through the clinker bed at a point 12 in. over the 4-in. bed of clinker in the primary section of the cooler. The secondary air temperature is thus held automatically at 900 deg. F. This preheated secondary air represents approximately 95 percent of the total combustion air entering the kiln; the balance consists of leakage around the kiln hood and air injected with the gas. Ratio of total air to gas is 11:1. Through automatic regulation of secondary air preheat, greater firing control is attainable than with the old rotary coolers.

Clinker Breaker

One of the new features of this installation is the clinker breaker after

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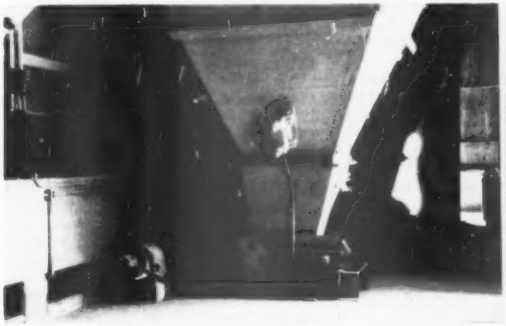
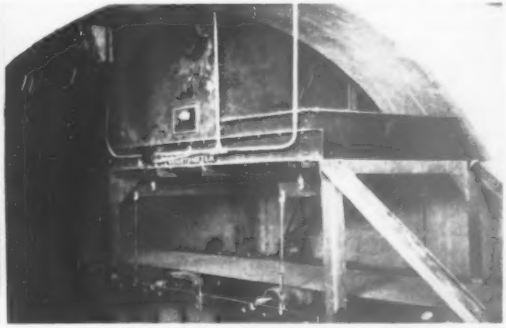
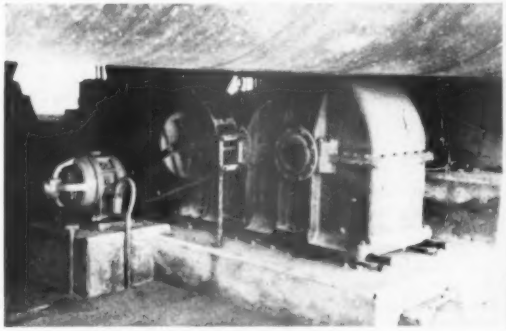
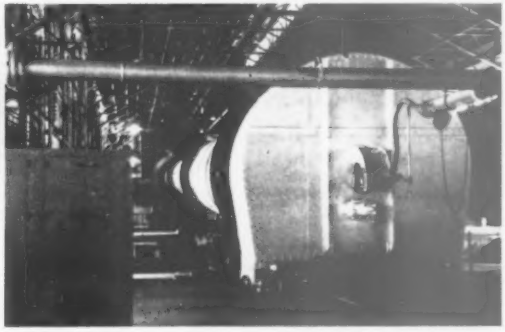




Left: Pan feeder actuated by interval timer pays out sand in controlled amounts to raw material conveyor, below. Right: Recording weighing machine for raw materials being conveyed to raw mill. Interval timer in circuit with it, is means of proportioning sand into raw mix





Kiln drive on new kiln, left is synchronized with drive of ferris-wheel slurry feeder. Right: Close-up of hood of new gas-fired rotary kiln

IMPACT of Basing Point Decision

Clarifying legislation on legality of freight absorption of vital importance to the future of American commerce, business and industry

By LESTER T. SUNDERLAND

THE PORTLAND CEMENT INDUSTRY was accused of collusion and conspiracy by the Federal Trade Commission *on suspicion* (FTC Docket 3167). The United States Circuit Court of Appeals, Seventh District, set aside the Federal Trade Commission's cease and desist order in that case because it found no convincing evidence, or direct testimony, that the cement industry was guilty of collusion or conspiracy as charged. The United States Supreme Court reversed the decision of the United States Circuit Court of Appeals and decided against the cement industry "on the finding by the Commission that an implied conspiracy existed." Collusion amongst the cement industry was implied from the fact that there was "identity" or "uniformity" of competitive delivered prices of their standardized product. *Such evidence was purely circumstantial.* That portland cement is a commercially standardized product under government specifications and no buyer will normally pay a penny more for one brand than another are well-known and undisputed facts. That there was no direct testimony in support of the allegation by the Federal Trade Commission, of conspiracy, collusion, or agreement as to prices, can be verified by any open-minded person sufficiently interested to read the record in that case (approximately 100,000 pages of transcripts and exhibits), which extended over a period of 10 years.

The charges lodged by the Federal Trade Commission against virtually all cement manufacturers in the United States from the Atlantic to the Pacific and Canada to the Gulf, were implemented by the revival of a trade association known as "The Cement Institute," (then virtually dormant and with comparatively few members), under the stimulus of "The National Industrial Recovery Act," during the depression of 1933.

The Cement Institute was thereby revived and expanded to include virtually all cement manufacturers in the United States, for the sole purpose of cooperating with, and at the request of, the President of the United States, in the establishment of the N.R.A. under said "National Industrial Recovery Act."

Under that stimulus cement companies which otherwise would not have had any reason or desire to become members of the Cement Institute, joined it to support the National Industrial Recovery Act sponsored by President Roosevelt, and in due course a Cement Industry Code of Fair Practices was approved by the National Recovery Administration and signed by the President. Had it not been for the N.I.R.A. there would have been no effective Cement Institute—but by reason of its including, for N.I.R.A. purposes, virtually all cement companies in the United States, the cement industry was thereby caught in a net under some antiquated conspiracy law, which in its application joins together both the innocent and the guilty, accusing all members with the alleged sins of any individual member,—therefore, membership in the Cement Institute (induced by the N.I.R.A. movement and later declared unconstitutional by the Supreme Court), was seized upon by the Federal Trade Commission to bring charges of a nation-wide cement industry conspiracy.

There is not now, and never has been, any commercial or competitive relationships between cement companies whose trade areas were not contiguous or over-lapping, and it was absurd to charge cement companies on the Pacific Coast with price conspiracies or agreements with cement companies on the Atlantic or Gulf coasts and vice versa.

Development of Industry

The writer has been engaged in the sale and distribution of portland cement for more than 60 years and in the manufacture thereof for 40 years. In 1888 the annual production of portland cement in the United States was only 250,000 bbl., whereas, 60 years later, in the year 1948, the production of portland cement in the United States approximated 200,000,000 bbl. During this period all the now existing portland cement mills have been built. The first or original mill was built in the Lehigh Valley of Pennsylvania by David O. Saylor, in about 1871, when he applied for a patent on his product.

In its early days American portland cement was manufactured only at a few points in the East, but as its value as a construction material and the science and art of its manufacture became known, and the demand for it increased, new mills were built in different parts of the United States where suitable raw materials, fuel and transportation were found available within reasonable distances from potential markets. During the last 40 years many mills have been built but failed. (At least eight mills have failed in Kansas alone and the plants dismantled, entailing huge losses to their owners.) In common with many others, the cement industry has been "through the toils." It had many years of adversity, and has had some years of prosperity. No new portland cement mill, if built in a competitive field, could ever have succeeded had it been "ham-strung" by requirements of law that compelled it to sell its product at rigid inflexible f.o.b. factory prices, or that prohibited it from quoting delivered or destination prices necessary to meet its competition at the market places. *The right to meet competition is a fundamental prerequisite to the success of any business or industrial enterprise* offering a competitive article, and is the keystone in the arch of America's free enterprise system.

Virtually every successful new cement mill ever built in a new location in the United States has added very substantially to the economic development and wealth of its community, and has materially reduced the cost of portland cement to all buyers and users within its freight advantage territory. Such wealth additions, and cost savings to the public, have been enormous and have been constantly accruing to cement users from the time such new cement plants started, down to the present time. However, since cement plants must be located where raw materials are economically available, they cannot always be near large consumption. The building of each new cement plant not only involved faith and confidence in future growth, but also the investment of large amounts of venture capital. Since each plant must manufacture its product at a cost permitting it to compete actively "at the market place," it is under absolute necessity of seeking production volume outside its freight advantage territory. To obtain such business, it must absorb its transportation and other economic disadvantages.

Such competitive outside business has been imperatively necessary to the success of the enterprise. This, briefly,

is the history of the development not only of the cement industry, but of every other competitive heavy industry in America—the right to meet competition by the absorption of its freight or other disadvantages being absolutely essential to its life as an industry.

"Basing Point System"

I submit below a brief analysis of the so-called "Basing Point System" in the Cement Industry.

What is this so-called "Basing Point System?" Is it a "monopolistic scheme" or "device" cunningly conceived to affect price controls and create price uniformity in the cement industry? Is it a "formula" collusively adopted by the cement industry to accomplish nefarious and illegal purposes? That appears to be a too common, although *wholly erroneous*, impression, which illustrates the seeming truth of the postulate:

"Error travels faster than truth."

The fact is, what has been misnamed by the Federal Trade Commission a "Basing Point System" is not, in the above sense, a system at all. It is the way in which virtually all competitive business has been carried on since the dawn of American "free enterprise," which is the foundation of America's progress; nor is it peculiar to the cement industry. On the contrary, it is virtually a universal practice where competitive business exists. It is inherent in the competitive strife for business. No new competitive enterprise can get into business; nor can any established competitive enterprise expand or long remain in business, if its prices are, by law, required to be rigid and inflexible f.o.b. factory, or if the law forbids any seller to quote delivered prices that are found necessary to meet competition at the market place.

Basing Points—What Are They? "Basing Points" in the cement industry are confined strictly to producing mills or transit storage points. The basing prices, or mill values, of cement are now, and naturally have always been, determined by each producer independently, according to his own best judgment in the light of his own individual situation. Mill costs, inventories, and marketing conditions vary from time to time at each mill. The record in The Cement Case (FTC 3167) shows there never was any evidence that the individual mill, or basing, prices were arrived at by collusion or agreement with competitors. If a mill happened to be in a "group of mills" from which the freight rates were the same to virtually all destinations, as is true with the six mills in Southeast Kansas and Northeast Oklahoma, then the individual mill in the group which established the lowest basing price obviously *forces all the others down* to its level. *Such uniformity* is compelled by competition. *Certainly no one will contend that the railroad freight rates were arrived at by agreement.* Then how can a cement producer be successfully accused of collusion or agreement in the determination of his delivered prices which are a combination of those two factors?

It is inconceivable that the Federal Trade Commission ever believed the "f.o.b. mill" basing prices were arrived at by collusion or agreement between competitors, or were capable of being so determined; otherwise, why would it now recommend them as "the only method above suspicion?" Further, it may be said, *collusion or agreement* between competitors usually connotes *artificially and exorbitantly high prices.*

Prices

What Are the Facts as to Cement Prices? This company's f.o.b. mill, or basing, prices of portland cement have increased since January 1, 1939, slightly less than 32 percent; whereas our labor costs have increased 90 percent, coal costs 170 percent, incoming freight rates on supplies and machinery parts 50 percent. Cement is probably the cheapest fabricated material known and its present factory cost is less than 6 mills (six-tenths of one cent) per lb. The January, 1949, "Monthly Review" of the Bureau of Labor Statistics states that from August, 1939, to November, 1948, wholesale prices throughout the United States increased as follows, to wit:

Cement	46.4 percent
Structural Steel	66.6 percent
Brick and Tile	77.3 percent
Paint and Paint Materials	96.8 percent
Plumbing & Heating	98.4 percent
Lumber	244.4 percent
Other Building Materials	96.2 percent
All Building Materials (Average)	126.5 percent

The above are uncontroverted facts from which the reader may draw his own conclusions.

The Market Place — What and Where Is It? Obviously, it is the place where the seller delivers or contracts to deliver, and the buyer receives or contracts to receive, any article in commerce. Virtually all sales of portland cement (except to railroads), prior to the Supreme Court decision, were for delivery f.o.b. destination points. The cement dealers, contractors, users, and their building projects are located at "destinations," hence "destinations" constitute "the market places" for portland cement.

What Is Price? Price, obviously, is the sum, or amount, the buyer pays for any article of commerce at any agreed or accepted place of delivery. It is equally obvious that the price paid by the buyer must always be the same as the price received by the seller at any contract place of delivery, and this is true whether the seller be a dealer, a distributor, or a user. Unless otherwise specifically agreed between seller and buyer, such a sale and transfer of property contemplates that the seller shall pay all elements of cost up to the place of delivery including transportation which, however, is but one element of cost. Others, such as the cost of containers, packing, loading, et al, may be—and in the Cement Industry are—also important and essential elements of cost.

Now the Federal Trade Commission, in The Cement Case, *invented a new definition* of the term "price" which seemed to better serve its determined purpose *to prove discrimination*; it defined price to be, not that which was actually quoted, charged, and received by the seller and paid by the buyer, but, the amount left to the seller after all costs of delivery were deducted.

That was a very clever device to deceive and distort facts. Obviously, when sellers absorb transportation costs to meet competition at myriad market places the sums left over will vary with the different amounts absorbed. Clearly, if different amounts are deducted from a fixed basing value, or figure, varying results inevitably follow. The FTC said, because these amounts varied, they constituted "unlawful discrimination."

It is inconceivable that a department of the government would wittingly go that far to win a case; therefore, it is difficult to understand why the Federal Trade Commission

The Author

• Lester T. Sunderland, author of this extremely interpretive discussion of basing points and marketing practices in the portland cement industry, is Chairman of the Executive Committee, Ash Grove Lime and Portland Cement Co., Kansas City, Mo. He has been engaged in the sale and distribution of portland cement more than 60 years and is one of the industry's more successful top executives. He is a past president of the Portland Cement Association. Mr. Sunderland is sincerely concerned with the effects on American industry, should no constructive, clarifying congressional action be taken in the matter of legalizing freight absorption. He has exhaustively considered all merchandising angles and we consider ourselves fortunate in having the privilege to publish his observations and valued opinion—The editor.

should distort the plain and generally accepted lexicographers' dictionary meaning of the term "price" in order to bolster a unique, arbitrary, untenable, and palpably wrong definition of "discrimination."

Identity of Delivered Prices. What is the vice, per se, in uniform or identical prices? Surely they should not be condemned on suspicion. It should not be assumed they imply collusion or agreement! Yet, the FTC says or infers that the only method of pricing "above suspicion" is "rigid f.o.b. factory." That method would create a "monopoly zone" for each cement mill within its local freight advantage territory, which no competitor with a disadvantage in transportation costs could reach. It would mean *enforced substitution, by law, of a "multiple monopoly zone system" in place* of the *highly competitive* "basing point" method which prevailed generally prior to the Supreme Court decision.

Why Should The FTC Condemn Delivered Prices? The writer cannot discern or find any good reason for this. The buyers of portland cement are not interested in f.o.b. factory prices. They have no facilities for knowing, or keeping informed of changes in, cement freight rates; the filing and collecting of claims for damage in transit; tracing shipments, et al;—such services are normally supplied by the sellers. The buyers desire to know what their cement will cost them at destination where they want to resell or use it, and they wish to buy it that way. Even the government usually wants to buy cement delivered at destination and the government witnesses in FTC hearings so testified.

What Is "Phantom Freight?" It is freight charged to the buyer which the seller has not paid. *There is no "phantom freight" involved in the sale of portland cement* at "delivered" or "destination" prices; only the actual transportation charges paid by the seller are included in the prices and sales of portland cement shipped to destination points of delivery. The basing point pricing practice of the cement industry is in no wise related to the old and long since abandoned "Pittsburgh Plus" practice in the steel industry and should not be confused with it.

The Government "Land Grant" Rates, which produced railroad freight rates with fractions that figured sometimes to the fourth or fifth decimal point, are no longer available, since Congress enacted the law which cancelled the Land Grant Act, effective October 1, 1947. Uninformed persons not familiar with the complications and variables involved in calculating Land Grant rates might naturally have looked with suspicion upon uniform or identical quotations carried out to the fourth or fifth decimal point, but competition forced that and the bidders knew from experience that the government would not pay a small fraction of a cent more for one brand of cement than another.

The Product

What Is Portland Cement? It derives its name from a building stone off the south coast of England where it was first invented and made. It is an artificial product whose principal basic raw ingredients are argillaceous and calcareous materials. These are pulverized to infinitesimal fineness, mixed in analytically fixed proportions and subjected to high heat (approximately 2800 deg. F.), and thereby converted to vitrified clinker, which, mixed with additions, is reduced in ponderous grinding mills to impalpable powder. It is a scientific process, highly technical. A new cement mill (sans site, raw material deposits, and working capital) would cost today at least $6.00 per bbl. of annual output. The replacement cost of buildings, machinery and equipment of all portland cement mills now in the United States would be well over $1,000,000,000. There are now 149 producing cement mills in the United States vs. 163 such plants in 1929.

Portland cement is a heavy, widely used, low-cost, standardized manufactured product for which, in normal times of plenty, no buyer, not even the government, will pay a tenth of a cent more to one seller for one brand than another. In general there is bound to be identity in the delivered prices of portland cement per force of competition, and if there is any lawful way to change that economic phenomenon, the writer has never been able to find it. When the Federal Trade Commission was asked how the cement industry could market its product under its "cease and desist" order in Docket 3167, it was silent, except to say that was a matter for the Industry to determine. It is my firm belief and conviction there is absolutely no way to change or improve upon the natural and normal way in which cement—until the Supreme Court decision—has always been marketed since the advent of competing factories. If non-uniformity of prices is essential, the only way to accomplish that would be by collusion between sellers to arbitrarily divide business by quoting agreed varying prices, which obviously would be an unlawful conspiracy.

Decentralization

Decentralization of Industry. There has been much discussion on this subject. Can the coal mining industry be decentralized? Nature placed the coal measures where they are. Likewise nature has placed the raw materials for the manufacture of cement where they are and they are not available in all sections of the U. S. Many states have none whatever and others have them only in limited quantities, or not accessible to fuel, water, transportation and markets.

For the above reasons the Cement Industry cannot be arbitrarily decentralized but even if the reverse were true, it would take years and many millions in money to build new mills after suitable sites were found, so that Utopian dream is not possible of practical realization; nor would such be either economically or socially desirable with its destruction of costly fixed assets and displacement of workers who would be thus deprived of their livelihood and homes.

The author represents an old, but one of the smaller independent cement companies. He desires to state that, under normal conditions, the effect of the Federal Trade Commission's cease and desist order as interpreted by the FTC and the legal profession generally is destructive and will affect adversely and disastrously our National economy, which has developed and grown under America's free enterprise system.

A shortage of portland cement has prevailed in all parts of the United States during the past year and, since the Supreme Court's decision in The Cement Case, sellers generally have received, and the buyers have paid, freight costs which, prior to the Supreme Court decision, were absorbed by the sellers in their competitive strife for business. This has cost cement users many millions of dollars which, under the old highly competitive method of pricing and selling cement, would have been absorbed by the cement manufacturers. Under that method, normally wholesale buyers could purchase their requirements of cement at lowest competitive prices delivered at their respective market places.

Competitive industry, and business generally, are now confused and bewildered. Much planned expansion has been deferred, or cancelled, because of this confusion and the uncertainties of the future under present statutes, and rulings of the Federal Trade Commission. Only Congress can remedy this un-American situation.

The conflicting testimony and opinions of the several Federal Trade Commission members themselves and the members of their legal staff have been most discouraging and disheartening. If the members of this Commission, which the Supreme Court described as "experts," cannot tell us what we can and what we cannot do under the law, we business men are left helpless. Therefore, it is imperative to the preservation of a sound National economy that Congress shall pass appropriate legislation to clear up the confusion which now exists and to validate natural and wholesome competitive practices which have grown up in industry over many, many years, and under which Ameri-

(Continued on page 189)

Manufacture of Masonry Cement

Industry's newest masonry cement plant placed in operation by Pennsylvania-Dixie Cement Corp. at Nazareth, Penn.

By WALTER B. LENHART

A NEW AND MODERN masonry cement plant was placed in operation on June 11 of this year by Pennsylvania-Dixie Cement Corp., New York, N. Y., at its Plant No. 5, Nazareth, Penn. Plant No. 5 was formerly known as the Penn-Allen plant, and during recent years has confined its production to Penn-Dixie high early strength cement. The new masonry-cement mill was built in that section of the plant formerly devoted to sacking operations. However, sufficient packing equipment still is in the building to take care of production. The masonry cement will be marketed under the trade name of "Penn-Dixie Masonry Cement."

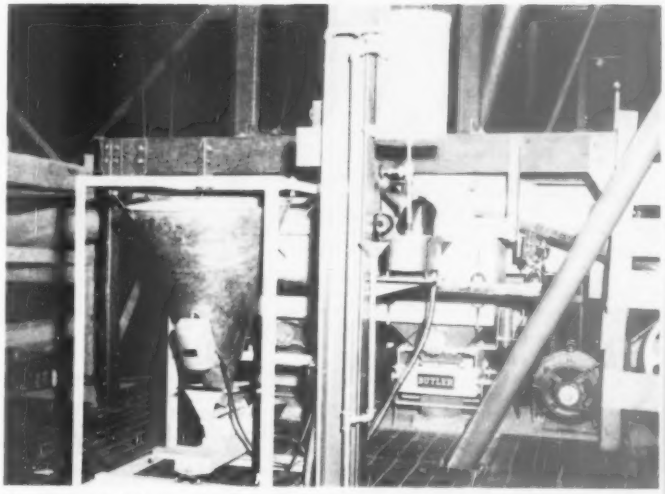
Masonry Cement Materials

Penn-Dixie masonry cement is made from high gypsum portland cement and pulverized limestone, along with two or more plasticizing agents. The high gypsum cement is delivered by truck to Plant No. 5 from Plant No. 6, a haul of about one mile.

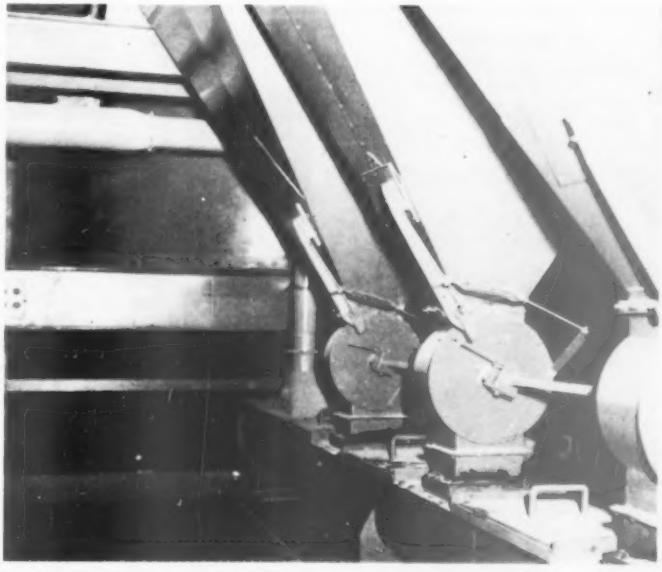
The truck bins are loaded from storage silos by Fuller-Huron Airslide transportation equipment, which is the first time this system has been used in the Lehigh Valley area. Limestone for the masonry cement is purchased from nearby sources and in so doing the company has selected that stone which gives the highest quality finished product.

Cement Delivery

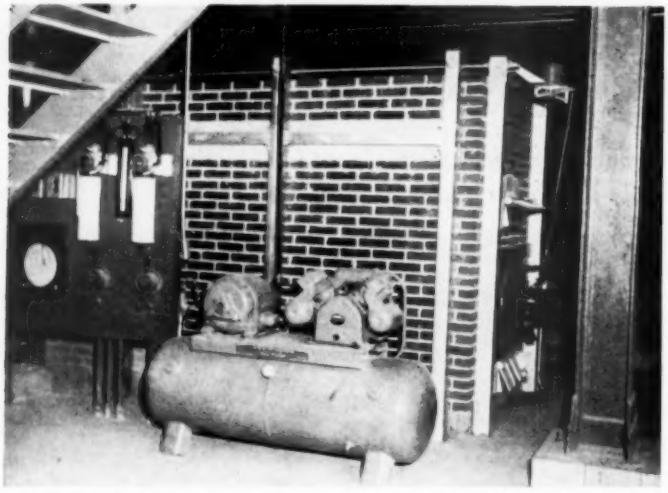
High gypsum portland cement received at Plant No. 5 is dumped to a truck hopper, and by means of a bucket elevator and seven belt conveyors it is delivered to inside storage. Under this storage pile is a screw conveyor operating in a reclaiming tunnel which serves another bucket elevator which in turn delivers to a screw conveyor in the upper portion of the new plant. This long screw delivers cement to a small, home-made vibrating trash screen. Material passing the screen goes to another screw conveyor operating over three steel circular bins mounted in a line. The first of these bins is the service hopper



Left, foreground, is electro magnetic vibrating feeder which delivers dry air-entraining agent to hopper; center is the cylinder for measuring wet plasticizing agents and, in background, is the weigh batcher



Screw conveyor, bottom, returns dust from bag-type dust collector to system. Coil springs are attached to mechanical knockers that aid in delivering fine dust to screw conveyor



Brick structure, background, is the oil-fired furnace that provides for drying the limestone while it is being ground. Directly in front is the compressor that supplies air to the burner, right. At left are the automatic feed controls for the finish mill (recording thermometer, extreme left). Note open treads on stairs, left

and the other two are for storage. The service hopper has 400-cu. ft. capacity for high gypsum cement. When the service bin is full, the flow is automatically carried over to storage bin No. 2, and when it is filled, to No. 3. The last bin is equipped with Fuller Co. Hi-Lo indicators so as to not overload the system. Material in the last two bins can be delivered to a bucket elevator, returned to the trash screen and sent to the day service hopper.

Limestone Delivery

Limestone is delivered to the plant already crushed and sized to minus ¾ in., where it enters ground storage. A small clamshell rig delivers the stone to a hopper serving a 20-in. Jeffreys inclined belt conveyor that delivers to a bin over a Raymond mill. Cyclone collectors over this mill deliver to a ground limestone bin opposite the service bin for live cement storage. A Sly bag dust collector is on the vent of the mill.

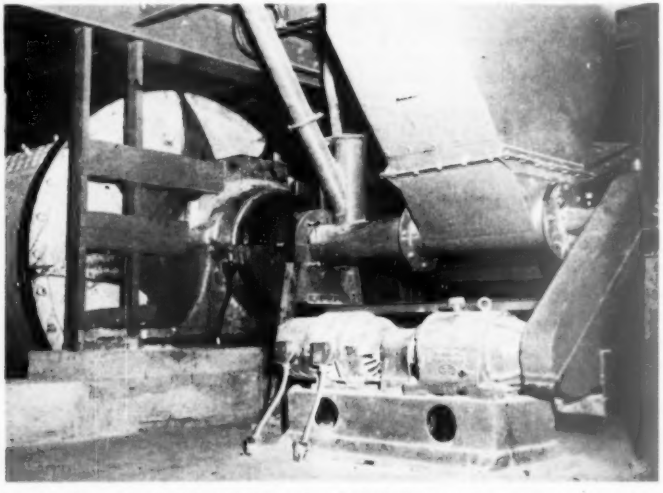
The mill is provided with an oil-fired furnace so that the limestone is dryed at the same time it is being ground. Air for the model 3-SAP, Petro oil burner used on the furnace is supplied by a small Worthington air compressor driven by a U. S. motor. A 60-hp. G. E. motor drives the fan on the mill. A Brown recording thermometer is mounted on the control panel alongside the furnace.

Material Batching

Ground limestone and high gypsum cement, before entering the mill, are weighed separately in individual Butler automatic weigh batchers. These two scale units receive their individual products from two short upwardly-inclined screw conveyors, the cement coming from the previously mentioned service hopper and the ground limestone from the bin following the Raymond mill. These scales are small and set close to the floor line and are automatically controlled so that one cannot dump ahead of the other. When the proper amount of material is in each scale hopper, it is dumped to a steel batch hopper ahead of the 6- x 22-ft. Allis-Chalmers tube mill. Into this same hopper is also dumped weighed amounts of vinsol resin, an air-entraining agent, that is delivered via a Syntron vibrating feeder. Oleic acid or other wet plasticizing agents are added via a small Clarkson feeder. The tube mill serves a dual purpose: it regrinds the materials, and, at the same time, acts to thoroughly mix and incorporate the materials and plasticizing agents so that a product of high uniform quality results. It has ample capacity to do the work. The mill is driven by a 300-hp. G.E. motor, turns at 24 r.p.h. and runs on water-cooled bearings. It discharges to a 6-in. Fuller-Kinyon pump that rests in a well near the discharge end of the grinding unit. A Fuller rotary compressor supplies air for the pump. This pump delivers finished material to several large bins in the stockhouse, where it is sampled and tested before

(Continued on page 195)

Set of rolls for preliminary grinding of minus ¾-in. limestone



Feed arrangement for the tube mill that assures final grinding as well as thorough mixing of all component parts of the masonry cement

This looks like a lot of money BUT
the Federal Government will spend
2974.9 times this much today.
$173,076,920.00 IN ONE DAY
TAXES ARE PRETTY HIGH

W. E. Umstattd, president, Timken Roller Bearing Co., stands in front of a display of 58,179 silver dollars, representing one day's taxes paid to the government by the company

Roller Bearing Manufacturer Marks Fiftieth Anniversary

The Timken Roller Bearing Co., Canton, Ohio, has built bearings ranging in weight from two ounces to 9068 pounds

AN INSPECTION TOUR of the Canton, Ohio, plant of The Timken Roller Bearing Co. was held recently for members of the press and visitors in honor of the company's 50th anniversary. Stenciled signs were in evidence throughout the buildings during the conducted tour which emphasized that "Taxes are pretty high," and that the company pays $58,179 per day to the Federal Government in taxes. At one stop on the tour a large glass container held silver dollars equal to one day's taxes.

President's Address

W. E. Umstattd, president, in his address to the visitors, stated that: "We would place orders this afternoon for a 50 percent replacement of the machine tools in our plants, if we had the money." Mr. Umstattd linked machine tool replacement to taxes. He said that machines which are more than 10 years old should be retired that the economies resulting from newer tools might be obtained. Since the outlook for lower Federal taxes is somewhat unfavorable, it is perhaps more significant that Timken requires replacement of a larger percentage of its machine tools than it is able to purchase.

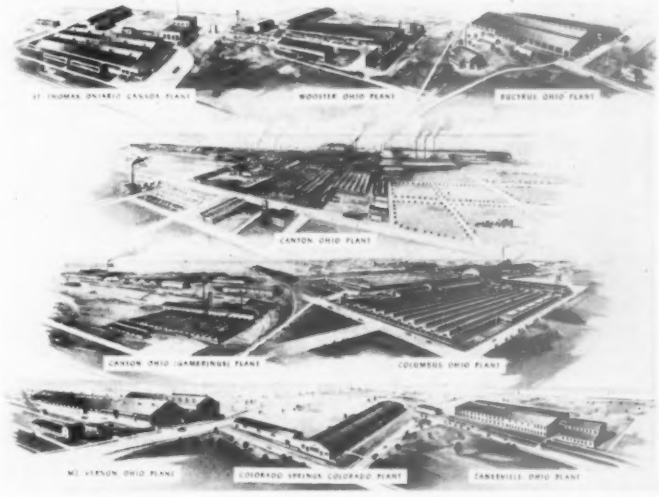
Steel Plant

After a four-hour walk through the Canton plants, viewing the tool rooms, hardening, carburizing, grinding, cage stamping and bearing assembly departments; and realizing that the company manages seven plants in Ohio and one in Colorado, the figure of 5,500,000 bearings per month capacity was understandable. The company consumes about one-third of the production of its own steel plant, which last year produced 600,000 tons of high-grade steel. In addition to making bearings adaptable to all rolling stock, the company also produces other items from steel such as detachable rock bits.

Detachable Rock Bit

The plant recently established at Colorado Springs, Colo., is in keeping with the company's rule of building plants close to the main source of product use—in this case rock bits. The first detachable bit was placed on the market in 1932, after two years of intensive research by the company. First conception of a detachable bit dated back to 1860, but there had never been a practical solution to the problem before the roller bearing company took it up.

Originally the business was confined to carriage, wagon and automotive fields, but in the period from 1909 to World War I, it expanded both in number and types of bearings manufactured as well as applications for their use. Today, Timken bearings are applied to every kind of machinery where rolling friction is a problem.



Composite view of nine Timken Roller Bearing Co. plants in the United States and Canada

Utilization of Low Temperature Kiln Gases

Recovery of heat from 270 deg. F. exit gases at plant of Skanska Cement Co., Koping, Sweden, utilized to heat offices, plant, a housing project and to keep clay-recovery barge ice-free in winter months

By Y. BARKELL*

SKANSKA CEMENT Co. started operation of the Koping plant in 1941 with two kilns 480 ft. long, producing 5800 bbl. per 24 hr. day. Both kilns are equipped with quadrants, chain systems and slurry dryers made by F. L. Smidth & Co. Gases leaving the kiln average about 270 deg. F. and pass through electric precipitators before entering the smoke stack. Equipment for recovering heat from the smoke has been supplied by a Swedish firm, Ramens Patenter, Stockholm, and the arrangement is shown on the accompanying diagram.

Flow Diagram of Waste Heat Recovery System

By following the diagram one sees that a portion of the gases, after having gone through the electric precipitator, are by-passed through a scrubber and returned to the flue by a fan. At present about half of the gases from one kiln are pulled through the scrubber, but the amount can be regulated by changing the speed of the fan. The scrubber is made of wooden staves with steel hoops and is 8 ft. 3 in. inside diameter x 38 ft. high. Water in the scrubber is maintained at a constant level and is circulated through the heat exchanger (3) by a circulating pump. (2). A small but constant flow of water enters the scrubber at the top and trickles down over a series of stainless steel plates. The kiln gases enter the scrubber at the bottom and pass through the water. Due to the intimate contact between water and gases, temperature of the gases is quickly lowered from 270 deg. F. to the dew point, which is about 165 deg. F. for 35 percent moisture content. At this temperature the moisture is condensing and the latent heat in the steam is transferred to the scrubber water.

The specific heat of the gases is quite low so that the amount of heat transferred to the scrubber water, when the gas temperature is lowered, is of minor importance. The main source of heat is the latent heat in the steam, and the temperature to which the scrubber water can be heated is very close to the dew point for the gases. For this reason it is important to avoid air diluting the kiln gases.

Water Circulation

In the laminated heat exchanger (3) the scrubber water is heating the circulating water which is circulated by pump (4) to radiators and hot water heaters throughout the plant. So far only a fraction of the capacity of the installation is utilized for heating the office and laboratory, repair shops and various other building space within the plant. Four hot water boilers with 700 sq. ft. total heating surface were used for this purpose, but these boilers are now used only for stand-by.

Home Heating

In order to better utilize the installation, it is planned to pipe the hot water to a group of homes occupied by approximately one hundred families about three quarters of a mile away. Pump (5) will circulate 300 g.p.m. through a 5-in. pipe and from this circuit, separate pumps in each house will circulate the hot water through radiators and hot water heaters.

Temperature of the water leaving the scrubber is about 165 deg. F. and the laminated heat exchanger 158 deg. F. When more heat is taken out of the system, the temperature will very likely drop lower, but is not expected to go below 150 deg. F., and this temperature should be enough to keep the homes heated even in extremely cold weather. Should more heat be needed in cold weather, the stand-by boilers can always be put into service. By means of a damper arrangement, one kiln can be closed off and the other hooked in on a moment's notice, thus minimizing chances for failure.

Other Uses for Heat

Another use for the available abundance of heat was tried towards the end of last winter and will be tried again this winter. Clay for the cement plant is taken from the river bottom by a clamshell bucket on a barge and the clay slip pumped to the plant. This operation is intermittent, depending on the demand for clay, and during prolonged severe cold weather the ice becomes increasingly troublesome. During periods when clay was not pumped to the plant, hot water was pumped through the same pipe line to the barge and kept both the pipe line and the equipment aboard the barge from freezing. By letting the water overflow into the river it also helped to keep ice from freezing too thick on the water adjacent to the barge.

*Skanska Cement Co., Koping, Sweden

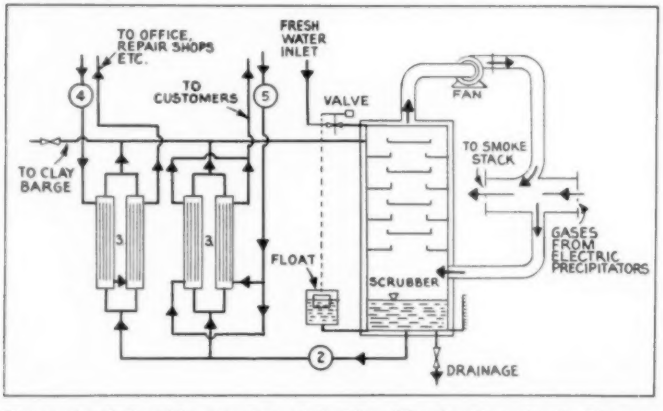


Diagram of method used for recovering waste heat from kiln exhaust in modern Swedish cement plant

Sells Gravel Business

JOSEPH A. DORN has sold his gravel business to C. F. Mittag and Son.

Fuel Conservation

(Continued from page 114)

f.o.b. plant pricing with its resultant restrictions on competition could not be made to hold in the face of developed facts.

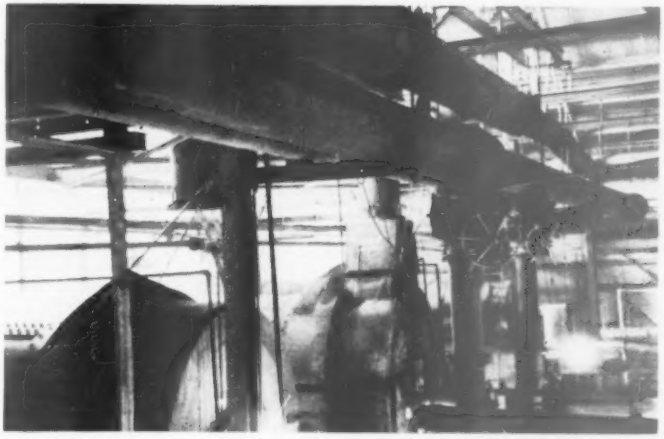
"Further decentralization because of high freight rates is another matter entirely, but in that connection the considerations involve facts and figures that in themselves provide the answers. The larger cement plant which must reach out beyond its home market for business may find that its yield on sales is being depressed by current high freight rates. A company in this position may consider the alternative of relocating a part of its capacity closer to the more distant portions of its market. But in doing so it may well be confronted by the fact that one or more additional operations will increase operating cost much more than the transportation costs that will be saved. We have considered moves that fall into this latter category but have never been able to calculate any net savings.

"Now as to the question, 'Are other forms of transportation than the railroads likely to be used?' This strikes us as a strange question because it seems to infer that no other forms are now being used. And that, as everyone knows, is not correct.

"Individual companies have different policies governing distribution of their products. Some will ship only in carload quantities. Some companies whose plants are situated so as to make trucking economical to certain markets do ship by truck as well as by rail. Still other companies, situated so as to make water transportation economical, do ship by water as well as by rail and truck. In many cases, where plants ship into certain markets by truck, other plants meet that delivery competition by handling their products through intermediate warehouses or terminals located within those markets. In such cases the products are usually transported from the plants to the warehouses or terminals by rail or water and shipped from there by truck.

"There has been little or no demand upon us for shipment by other forms of transportation than rail. In this connection we have repeatedly asserted the basic policy that we sell cement in wholesale quantities only, usually to dealers whose business it is to break down these wholesale quantities and to provide the utility of time and place on the jobs. We feel that the building material dealers are the backbone of our business. Therefore, to ship less than carload quantities constitutes an invasion of the province of our principal customers and that makes us their competitor. We consider it bad business to compete with our customers.

"Your next question is whether there is a need for increased capacity in order to keep up with demands for cement generally or in particular areas. You are aware, of course, that some substantial additions to capacity have been or are being made in South Carolina, Florida, Louisiana, Texas, Arizona, Missouri, Iowa, Nebraska, and Michigan. This perhaps, is only a partial listing. Generally, we lean to the view that existing capacity is more than ample to cover the foreseeable demand."



As an alternate to use of natural gas, Universal Atlas' Independence, Kan., plant has single unit coal pulverizer delivering to this header a circulating stream of fuel which is tapped to fire one or more kilns (see ROCK PRODUCTS, May, 1948, p. 74)

Another large manufacturer in the East with multiple plants said:

"The interpretations generally made of the Supreme Court decision in the Cement Case have had the effect of shrinking market areas. However, this will be offset somewhat by a return to competitive pricing which will undoubtedly come about if Congress enacts pending legislation permitting freight absorption. Nevertheless, it is a fact that freight rates on cement have increased almost 60 percent since 1946 and this has the effect of reducing our shipping range. Even under new legislation permitting freight absorption, these large increases in freight rates will prevent our distributing our products at competitive prices over as wide areas as formerly.

"While there are some localities where additional production apparently could be utilized, we do not believe new plants will be built on an extensive scale for the following reasons:

"1. The present over-all productive capacity of the cement industry is sufficient to take care of the foreseeable demand in any normal year.

"2. Increased interest and amortization charges on present high cost of plant construction would require considerably higher selling prices than at present to pay out satisfactorily.

"3. Ideal plant location is in proximity to satisfactory raw materials and substantial markets. Most of such known locations are already occupied.

"The trucking of cement is increasing in certain areas and we do not foresee a change in this trend. Doubtless, the increase in rail freight rates has contributed to this increase in trucking."

A manufacturer of cement in the Great Plains region commented:

"Concerning cement distribution, there have been two important developments the past two years which have seriously circumscribed normal marketing areas of cement mills. These are,

"1. The Federal Trade Commission's cease and desist order (3167) and the Supreme Court decision in the Cement Case, which, as interpreted generally by legal counsel and the Commission, required cement producers to sell their products at mill instead of destination prices, which automatically shrank their marketing areas, limiting them to their freight advantage territories, except to the extent buyers were willing to pay the extra cost represented by their freight disadvantage, at points outside thereof.

"2. The practice of the railroads of raising cement freight rates percentagewise (vs. flat increase per 100 lb.), increased the amounts necessary for cement mills to absorb in order to meet competition outside their freight advantage areas.

"Accordingly, it is plain that where a cement mill formerly absorbed a freight differential, or disadvantage, of 20c per bbl., percentagewise increase of 150 percent would require it to absorb 50c per bbl. in order to sell its product at the same competitive destination point. It is obvious the percentagewise method of increasing cement freight rates compounded

(Continued on page 162)

New quarry being opened near top of 4300-ft. Malone mountain left, and right, picture taken from one of the buckets on 3000-ft. section of tramway looking down to transfer point

Tramway Delivery of Limestone

Northwestern Portland Cement Co., Seattle, Wash., installs 6000-ft. aerial tramway of 150 t.p.h. capacity to carry minus 4-in. stone to plant from high elevation quarry

By FRANK FRINK, JR.*

WITH CONSTRUCTION completed on a 6000-ft. aerial tramway at Grotto, Wash., Northwestern Portland Cement Co., Seattle, this summer will be able to obtain limestone from a new quarry on top of a mountain peak 4000 ft. high. Probably no limestone deposit in the United States is being worked in a more inaccessible spot, with vertical cliffs surrounding the quarry on all sides. C. T. W. Hollister, president of the cement company, estimates the deposit contains sufficient material to supply the plant for 100 years or more at the rate of 100,000 tons of rock annually.

Stone from primary crusher plant, center, is carried to tramway loading hopper by 30-in. covered belt conveyor on 175-ft. centers, left

Details of Tramway

Stone from the new quarry will be transported via a 13,000 ft. aerial tramway with a 3450 ft. drop in elevation and two changes in direction, the trip from quarry to plant taking only 21 min. The tramway connects the mine to the cement plant, located on the Great Northern railway in Stevens Pass. During the short five-months season, June through October, when the mountain is free of snow, 150 tons of minus 4-in. rock an hour, 16 hr. a day, move from quarry to plant. Rock mined during this period must supply the plant for the entire year.

Plans for the new quarry were commenced in 1943 when increased pro-

(Continued on page 207)

Jim Halleran, quarry superintendent, Northwestern Portland Cement Co.

*Engineer in charge of tramway construction, Washington Iron Works, Seattle, Wash.

DETAILED VIEWS OF 6000-FT. AERIAL TRAMWAY INSTALLED FOR NORTHWESTERN PORTLAND CEMENT CO.

No. 1: Quarry-run stone is trucked along upper road to point just short of service shed, where it is dumped to primary crusher hopper. No. 2: Old tramway, foreground, with connection point with new tramway across canyon. No. 3: Buckets on highest section of tramway dump rock to bin, center, for transfer to buckets on second section of tramway. This is the highest point of the road, from which equipment was carried to the quarry by tramway. No. 4: Equipment and equipment sheds at the quarry. No. 5: Cement plant, 3450 ft. below quarry. Note end of kiln to right of left hand building

Fuel Conservation

(Continued from page 159)

the rate handicaps of the more distant mills vs. the nearby mills. These handicaps have been enhanced by the railroads, through their elimination of the fractions in cement rates, which tended to both

"a. Further increase the rates themselves and

"b. Further distort normal rate relationships.

"The first authorized mileage freight rate scales applicable to portland cement, were established by the Interstate Commerce Commission in I.C.C. 8182, effective in August, 1918. Subsequent thereto mileage scales were applied to cement rates in all rate territories east of the Rocky Mountains. In the creation of those mileage scales the I.C.C. sought to establish,

"a. Rates which were reasonable, and

"b. Rates relationships between points of origin and destination that would permit the free movement of cement from all producing points to their common markets.

"Since those initial scales became effective, cement rates have increased an average of about 150 percent, and the old established rate relationships in the cement rates have been distorted and the spreads between the different points of origin to destination points have likewise increased, an average of about 150 percent, thus there is now imposed upon cement producers freight rate disadvantages they can no longer absorb. Accordingly, their markets are restricted and long-established customer relationships have been destroyed.

"Because the demand for cement in all areas has for some time, and until quite recently, far exceeded the supply, the impact of these forces has for a time been minimized in fact, largely eliminated. However, the change from a seller's market to a buyer's market condition (now obtaining) brings to the cement producers a shocking realization of the shrinkage of their normal markets and margins due to the above causes.

"With the passage by Congress of clarifying legislation now pending, all cement manufacturers will again be reaching out beyond their freight advantage territory to the extent they can economically absorb their freight disadvantages, but, under present conditions that will present a gloomy outlook for the American cement industry unless, and until, the present freight rate structure and distorted rate relationships shall be restored to normalcy. Meantime, the rail carriers, having priced themselves out of the market by raising their rates to and beyond the point of diminishing returns, will continue to lose their long-hauls on cement and be menaced by modern truck competition for the short-hauls.

"The aggregate capacity of cement plants of the United States now substantially exceeds all normal demands for cement. For that reason, and others, I doubt many new plants will be built. Some industries can be decentralized while others cannot. Obviously, the cement industry cannot. Existing companies have generally expanded their own operations to meet their present, or prospective needs. Where at certain plants the raw material deposits have become exhausted, new replacement plants may be built to supply the marketing areas thus abandoned, but for any new enterprise to attempt the building of a new portland cement plant anywhere in the United States at present high construction costs would, in my opinion, be, from an economic standpoint, a very hazardous venture, and the risks would be very greatly increased by the distorted freight rates situation above described."

Fuel Conservation

Because of the very definite trend to long rotary cement kilns in American plants and the increased attention being given to firing practices, the savings in fuel thus realized have been substantial for many installations and we sought, in our letter, to ascertain how much fuel reduction has resulted. Instrumentation is a live and somewhat controversial subject as are the higher speeds of rotation adopted by some manufacturers in the operation of kilns, so we requested the thinking of the industry on these specific phases of operation.

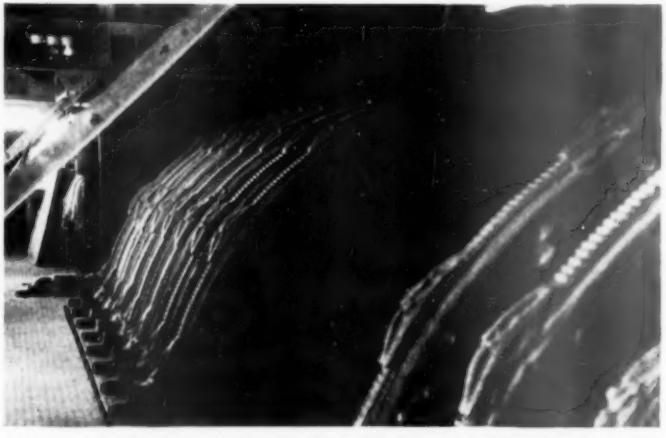
We did not anticipate data on fuel savings, by virtue of long kiln installations and the use of other conservation devices and practices, to be available factually on the basis of experience from all plants because kilns in most plants today are being pushed to production rates that are not favorable to low unit fuel consumption. Furthermore, waste heat boiler plants continue, in many cases, to burn excess fuel in order to increase steam generating capacity. Depending upon the purchased power rates in an area, this practice is sometimes economic although the consumption of fuel per bbl. of clinker is unduly high. Comparative B.t.u. consumption for relatively new kilns as compared to figures for older kilns has been given us by certain companies on the basis of anticipated use of fuel later when the kilns are operated under optimum conditions.

Any comparison of fuel consumption, between kilns as operated today and ten years ago, has little meaning unless all conditions and related practices are considered. However, the industry is burning less fuel and savings are considerable in many plants dependent, however, upon the degree of inefficiency in past years.

For example, one large concern with many plants has reduced fuel requirements only two percent on the average for all plants over a ten year period. This company, however, had relatively efficient plants back in 1938, and the two percent improvement in B.t.u. consumption did not result from extensive changes in calcining equipment but from the maintenance of more uniformity of all factors that enter into burning cement clinker. Among them are chemical composition, rate of feed, temperatures of primary and secondary air, kiln speed and draft.

On the other hand plants which have installed rotary kilns 300 ft.

(Continued on page 164)



Most recent installation of slurry filters, at Detroit, Mich., plant of Peerless Cement Corp., was instrumental to saving up to 30 percent coal in waste heat plant (see ROCK PRODUCTS, August, 1948, p. 134)

COLLECT DOLLARS WITH SLY DUST FILTERS

BENEFIT BY SLY'S GREATER COLLECTING EFFICIENCY

This is a typical Sly installation. Literally, hundreds of similar installations are in use in connection with production of cement, crushed stone, agricultural limestone, gypsum, asbestos, talc, feldspar, fluorspar, gold, copper and iron ore, diatomaceous earth, bauxite, etc.

Sly Dust Filters collect dust generated in such operations as crushing, grinding, screening, conveying, loading, separating, and mixing—Saving valuable materials, adding to net income.

Sly Filters are saving money for their users by providing cleaner plants, better working conditions, greater production, less cleaning up (interiors, roofs, surroundings, etc.), and cleaner products, which sell better. Thousands of installations.

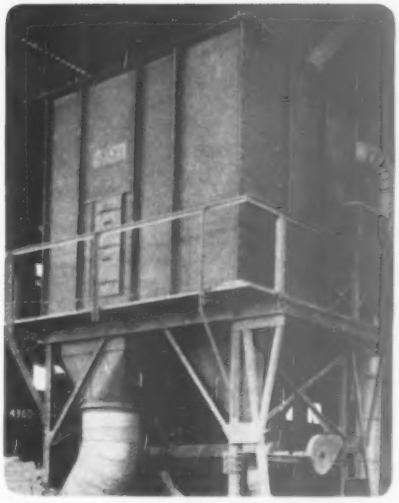


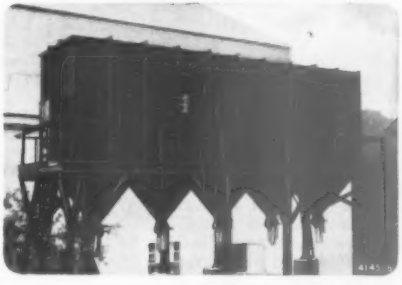
Illustration above shows a Sly Dust Filter in the pack house of a cement plant. Several dust pipes enter the fan side of the filter. The exhaust fan is located on the floor below filter. A screw conveyor automatically and continuously removes the collected cement.

NOT EXPENSIVE — SLY FILTERS SOON PAY FOR THEMSELVES

Sly Dust Filters get all the dust by filtration through cloth. They offer you:

1. **Greater filtering capacity because of more filtering cloth.**
2. **Taut bags (patented) save power and improve dust removal.**
3. **Bags more easily replaced.**
4. **Automatic control (any degree) minimizes or entirely removes the human factor.**
5. **Simpler shaker mechanism results in savings in maintenance and operation.**

IN BRIEF, THEY PROVIDE FAR GREATER COLLECTING EFFICIENCY



Sly Dust Filter in a rock crushing plant. Hundreds of plants in this industry are realizing better profits by using Sly Filters.

SEND FOR REVISED BULLETIN 98

Packed full of helpful information on dust control — photographs of installations, data on installations, etc. Tell us your problem so that we can write you fully. Benefit by the savings we can offer you.

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long or more have actually reduced fuel consumption in the range of 10-20 percent or more according to B.t.u. figures supplied us, in comparison with former practice or with shorter kilns still in service. Greater production accompanys the more effective burning because these kilns not only have great length but larger diameters than early kilns.

In an extreme case where very short kilns with waste heat boilers have been supplanted by one of extraordinary length and diameter, B.t.u. consumption has been reduced from 2,000,000 to 1,000,000 B.t.u. per bbl. Long dry process kilns are burning clinker with a fuel consumption between 800,000 and 900,000 B.t.u. per bbl. The low for the United States, appears to be 704,000 B.t.u. for Lepol kilns but with some sacrifice in labor costs. Quotations that follow provide data on fuel consumption and capacities for kilns of various sizes.

Instruments

In one case, skepticism was expressed on the value of instrumentation but the industry as a whole has faith in the use of instruments and anticipates much better kiln performance by their use, as kiln operators gain experience with them. Many types of instruments are being installed, and some of the newer installations of kilns are rather completely instrumentalized.

Experience has shown that long rotary kilns are super-sensitive to any fluctuations in operating variables and the industry intends to employ all means to attain uniformity as the key to maximum output, fuel economy and quality of product. Other articles in this issue consider the use of the continuous oxygen analyzer in actual plant practice. Apparently such control equipment has been perfected to become a very useful tool. Quick detection, through gas analysis, of changes occurring in a kiln is the means of quick adjustment to compensate for a changing condition which otherwise might result in over-burning or under-burning of clinker load surges, ring formation, etc.

Operators of long kilns, in a number of instances, are using recording thermocouples at various points over the length of kilns, usually at the low end of a chain system to record temperatures beyond the burning zone, that are very informative to the burner and enable him to change kiln speed or other controls to compensate for changes which indicate rapid cooling, for example, which may be due to changes in fuel, the existence or formation of mud rings, or other conditions. With from two to three hours time required for material flow through a kiln, it is desirable and necessary to make corrections quickly rather than wait to observe the effects in the product sometime later.

Instruments are performing functions such as these and will play an increasing role in the future, not only because a ton of coal costs $8 or so and is highly variable in moisture, contaminants and sometimes of very low heat value, but also because uniformity in burning is reflected directly in quality of product.

Kiln Speeds

Apparently, the trend to higher kiln speeds is well established, but the average speed of rotation falls within 60-75 r.p.h. for kilns, many of which were turned half or two-thirds as fast a few years ago. The one great exception is a concern that operates kilns as fast as 110 r.p.h. but at lower pitch.

An advantage claimed for really high kiln speeds is that a thinner bed of material, as fed, has more intimate contact with the heat radiated from the kiln refractories, and uniformity of burning results as well. It has been claimed that kilns, when properly operated at high speeds of rotation, are capable of greater production not because more material is fed than before but because uniform high output can be obtained per unit of time. Dust losses, of course, become greater.

In one case, a manufacturer stated that the advantages of kiln length have been offest by operating complications that nullify the expected fuel economies, according to experience to date. These kilns are 400 ft. in length and have had one year's service. An interesting observation by a large cement manufacturer indicates to what degree fuel economy suffers when kilns are pushed hard for production. An increase in clinker production of 21 percent at one of the company's plants resulted in a 19 percent increase in B.t.u. per bbl. of clinker.

Some of the more interesting comments follow:

A large manufacturer with many plants, both dry process and wet process, said in part:

"The weighted average of the B.t.u. requirements for burning clinker in all our plants shows a reduction of 2 percent in 1948 as compared to our practice in 1938.

"Our B.t.u. requirements for burning will vary with the production rates of our kilns. For instance, in one plant an increase in clinker production of 21 percent increases the B.t.u. requirements per bbl. 19 percent. It can be understood that the kilns in our company have for the past two or three years been operated for maximum production rather than for fuel economy.

"Our newer kiln installations have a flatter pitch than older installations to permit higher speeds of rotation up to 110 r.p.h. We believe higher kiln speeds with a thinner bed of material make for better fuel practice, other conditions being equal.

"We believe that kiln instrumentation such as O_2 recorders, radiation pyrometers, exit gas temperature recorders and kiln speed indicators are helpful in fuel conservation and overall good practice in kiln operation. We are interested in the idea of installing recording thermocouples between the feed and discharge ends of our longer kilns, in order to know more accurately what is taking place up the kiln beyond the burning zone. We believe thermocouples would be especially valuable in long wet kilns, in detecting the formation or existence of mud rings.

"It is our belief that the industry can go too far on kiln length, merely for the purpose of fuel conservation. The economies obtained on fuel should be carefully balanced against capital expenditure and operating economies resulting from long versus medium length kilns.

"It has been our experience that the greatest economies in kiln operation result from maintaining uniform conditions in the kiln. These uniform conditions include the following:

"1. Uniform chemical composition and quantity of feed

"2. Uniform fuel input

"3. Uniform temperature of primary and secondary air

"4. Uniform kiln speed

"5. Uniform draft.

"The maintenance of uniformity of the above factors will result in fuel economy, maximum production and maximum refractory life."

A Midwestern producer with several mills commented:

"Since the end of the war, emphasis has been placed on production rather than fuel economy, but with a return to normal demands and the inevitable necessity for best fuel economy, the inherent advantage of the long kiln over the short kiln, from the standpoint of fuel economy, will become very important. Determination of optimum production rate, a really positive control of firing rate and exit gas analysis, and maintenance of an adequate chain system, are considerations that are involved in best fuel utilization."

Another of the country's largest manufacturers, with a chain of plants, said:

"Rotary kilns used for burning portland cement clinker, lime and many other similar items, have been built since 1888, when the ordinary size was 5 ft. dia. by 25 ft. long. Since then both dimensions have steadily been increased for the purpose of obtaining more output per hr. at the expense of less fuel. The improvements, as actually obtained in practice, have been largely based on experiments rather than scientific formulas, as there seems to be no definite constants, results being greatly affected by local

(Continued on page 196)

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performance . . . efficiency . . . POWER

Power to spare in this sturdy Plymouth Locomotive, with the efficiency and speed that mean operating economy for the Redfield Brick and Tile Co., Redfield, Iowa.

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The opinion of this skilled, experienced Plymouth operator tells a story of smooth, efficient Plymouth service all along the line from clay pits to finished product. Powerful Plymouth Locomotives can solve *your* haulage problems, too . . . with greater operating economy than you'd believe possible.

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DEVELOPMENTS In Cement

Cement research, exploration of deposits, reactive aggregates, air entrainment and design of concrete among subjects considered by A.S.T.M.

By NATHAN C. ROCKWOOD

WHILE MOST OF THE PAPERS and discussions of the American Society for Testing Materials deal with research and methods of tests, there are always many items that are of immediate interest and value to producers, manufacturers and users of rock products. The 1949 annual meeting of the Society at Atlantic City, N. J., June 27 to July 1, was no exception. Space permits only a sketch of a few high points. Those interested can readily obtain any of the papers mentioned here by writing to the Secretary of the A.S.T.M.

Differential Thermal Analysis

Researchers in cement, aggregates and concrete, as well as producers and users will find something of interest in a paper by V. F. B. de Mello, research associate, and T. William Lambe, assistant professor, Department of Civil and Sanitary Engineering, Massachusetts Institute of Technology, on "The Procedure and Significance of Chemical and Mineralogical Tests on Soils." It is an attempt to solve some of the problems of soil mechanics by means of a relatively new approach through differential thermal analysis. Hitherto soils have been subjected to standard engineering tests to determine such properties as permeability, shear strength and compressibility in connection with their use for foundations, pavement bases, soil cement mixtures, etc.

The method of differential thermal analysis depends on the fact that the various soil minerals have different thermal characteristics when heated. When these characteristics for the pure minerals are once determined, mixtures in various percentages show a thermal change curve, which can be compared with these, and with that of an inert mineral, and an approximate chemical analysis determined. Used in conjunction with chemical tests, the authors claim a method for: (1) identification of soil minerals; (2) determination of the hydrogen ion concentration of soil; (3) detection of deleterious substances; (4) determination of exchange capacity and exchangeable bases.

As we have endeavored to show in previous articles in ROCK PRODUCTS, probably all these factors are as important to design of concrete mixtures as to soil mechanics. The authors of this paper do not mention the parallel, but it is apparent to one familiar with some of the problems involved in the disintegration of concrete. For example, it is stated: "In soil mechanics there seems to be three important clay mineral groups: kaolinite, illnite and montmorillonite. These groups consist essentially of the same chemical elements, but the structural arrangement of these elements is different. While there remains much to be learned about the engineering properties of the clay mineral groups, some qualitative data are available on these properties. Kaolinite is the least active of the clay minerals; it has the highest permeability, the lowest water adsorption, and the lowest compressibility of the three clay minerals. Montmorillonite is at the other extreme, having the lowest permeability, the highest water adsorption, and the highest compressibility. The illnite group is between these two extremes."

What may this mean in terms of the properties of certain aggregates? Limestones for example often contain clay impurities. Some of these appear to be harmless when the material is used as a coarse aggregate; others appear to cause rapid disintegration. It has been an established fact that limestones which contain clay or shale in the form of montmorillonite expand and disintegrate. Yet montmorillonite has low permeability but high water adsorption. In other words, it is a question of porosity and the small size of the pores, rather than the chemical or mineral constituents which determine its suitability as an aggregate. Kaolinite, although the most permeable, is the most stable, because, apparently, it has no fine pores to fill with and retain water and dissolved salts. Isn't it possible then that we may also have concretes with the physical characteristics of either montmorillonite or kaolinite? These two "clay" minerals are hydrous aluminum silicates with various minor mineral impurities, and something like them must be formed when concrete sets and hardens.

Geophysical Exploring

There is now quite an extensive literature on geophysical methods for finding out what lies beneath the surface covering of the earth. These methods have been used for locating rock and gravel deposits, and for determining the depth of overburden, without disturbing the surface. Here, we merely wish to call attention to the latest contribution on the subject, a paper by E. Raymond Shepard, U. S. Corps of Engineers, "Subsurface Explorations by Geophysical Methods." This paper describes the essential principles of both the seismic and the electrical conductivity methods, with the results of field tests, which show the methods to be relatively rapid and inexpensive. Methods of interpretation and analysis are described.

Cement Research

Nothing very startling developed in the committee discussions on cement testing and research. The subcommittee on additions (with special reference to air entraining agents) announced a change in policy which it believes the Society should adopt.

The committee does not believe it is within the province of the committee to pass on the merits or demerits of any of the many additives now on the market. It believes its duty ends when it has established a suitable test for the effectiveness of such additives, and it will then be up to the purchaser to make his own investigations and use his own judgment.

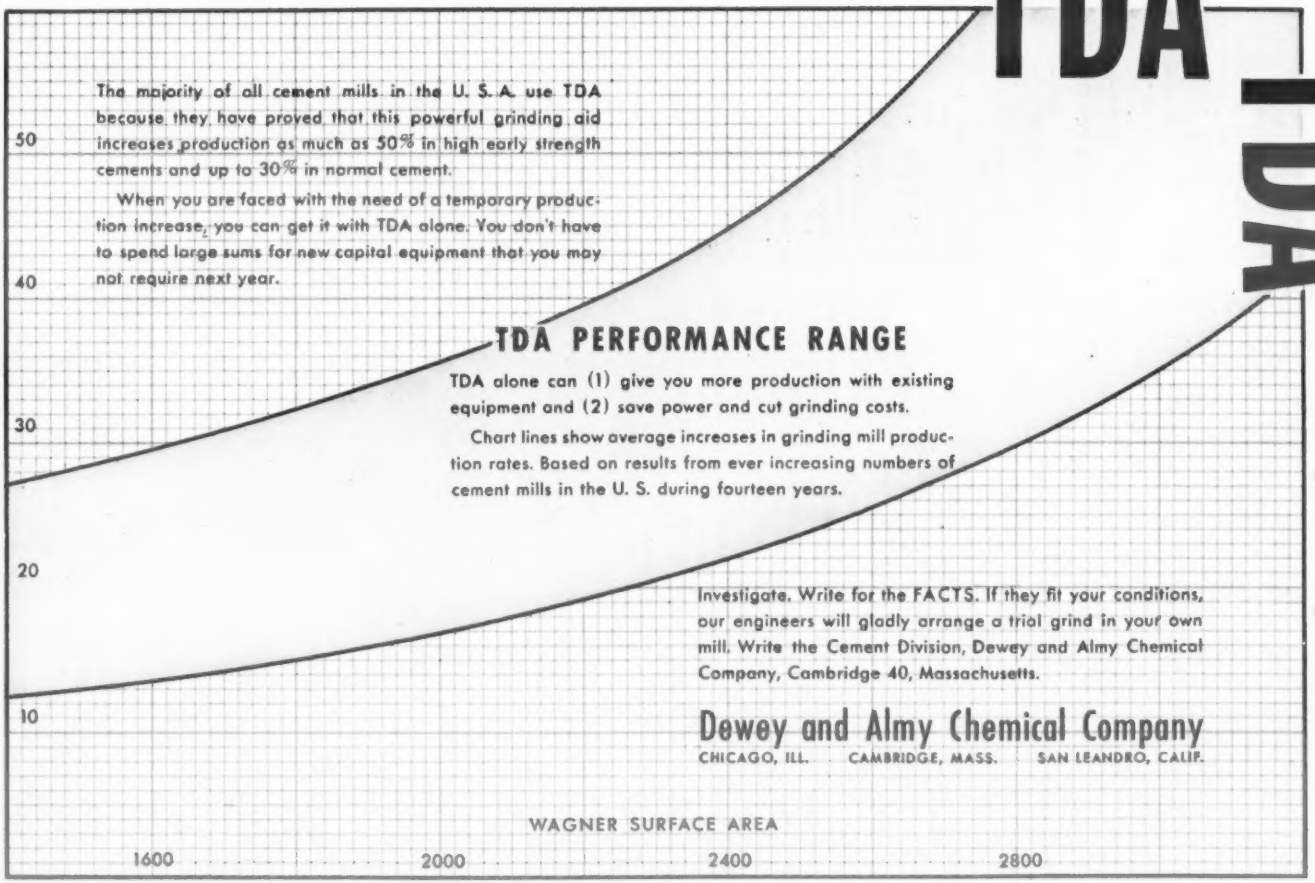
The working committee on strength submitted a report, which is published as a part of the Report of C-1 on Cement, on "Coöperative Tests on the Comparative Relationship of Tensile, Compressive and Flexural Strength of Mortar to the Flexural and Compressive Strength of Concrete." The purpose of these tests is to explore the possibilities of developing a test for flexural strength of mortar which would be suitable for use as a specification test. Many European specifications have such a test. Although the committee took no positive action, its report shows the flexural test may well serve this purpose.

The working committee on SO_3 content also submitted a progress report, published as part of the Report of C-1 on Cement. The work of this committee is the result of the paper by William Lerch, of the Portland Cement Association, 1946 Proceedings, in which it was developed that portland cements of different chemical analysis (with particular reference to the alkali content) require varying amounts of gypsum retarder. He described methods for determining the optimum amount of gypsum with which a portland cement will exhibit

for improved cement mill production

TDA

TDA saves grinding costs



The majority of all cement mills in the U. S. A. use TDA because they have proved that this powerful grinding aid increases production as much as 50% in high early strength cements and up to 30% in normal cement.

When you are faced with the need of a temporary production increase, you can get it with TDA alone. You don't have to spend large sums for new capital equipment that you may not require next year.

TDA PERFORMANCE RANGE

TDA alone can (1) give you more production with existing equipment and (2) save power and cut grinding costs.

Chart lines show average increases in grinding mill production rates. Based on results from ever increasing numbers of cement mills in the U. S. during fourteen years.

Investigate. Write for the FACTS. If they fit your conditions, our engineers will gladly arrange a trial grind in your own mill. Write the Cement Division, Dewey and Almy Chemical Company, Cambridge 40, Massachusetts.

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RDA — a low cost grinding aid for dry raw materials. Gives 20 to 50% increased grinding production at identical fineness. Other benefits such as uniform and smaller sized clinker and increased kiln output have been noted.

Airalon C M — a grinding aid and plasticizer. Gives high quality masonry cement at low cost. Air entraining agent.

greatest strength, least shrinkage upon drying and least expansion upon wetting. The committee by a series of coöperative tests is exploring the possibilities of writing his findings into a specification to cover the addition of gypsum to cement clinkers.

A paper dealing with, "The Use of Natural Anhydrite in Portland Cement" discussed an old subject, the value of anhydrite vs. gypsum. The authors are W. C. Hansen and J. O. Hunt, manager and research engineer, respectively, of the Research Laboratories of the Universal Atlas Cement Co. A comparison of the results obtained with gypsum alone, and with blends of gypsum and natural anhydrite showed that with one clinker, 25 percent and, with the others, 60 to 75 percent of the gypsum could be replaced by natural anhydrite without adversely affecting the properties of the cement. In a few cases, it might be possible to substitute anhydrite completely for gypsum.

Rudolph C. Valore, Jr., James E. Bowling and R. L. Blaine, all materials engineers, National Bureau of Standards, had a paper entitled: "The Direct and Continuous Measurement of Bleeding in Portland Cement-Water Mixtures." It is confined to describing a method of test. However, the introductory paragraphs make these general comments about "bleeding," which are interesting. "High bleeding rates, accompanied by 'channeling' and a subsequent removal of appreciable quantities of very fine particles from the cement paste matrix to the upper surface of a concrete, may cause planes of weakness in the hardened material. Excessive bleeding may also account for water pockets and loss of bond at the underside of coarse aggregate restricted from movement [packing by gravity] as in narrow forms, and at the underside of horizontal reinforcement. A moderate amount of bleeding, however, facilitates finishing operations such as screening and troweling, and in the fabrication of cement-asbestos products, spun concrete pipe, and vacuum concrete, high bleeding cements are desirable."

Concrete and Concrete Aggregates

Committee C-9 on Concrete and Concrete Aggregates recommended tentative methods of test for (a) bleeding of concrete; (b) air content of freshly mixed concrete by the pressure method; (c) air-entraining admixtures for concrete; (d) comparing concretes on the basis of bond developed with reinforcing steel; and (e) soft particles in coarse aggregates. The committee has approved definitions of "mineral aggregate" and of "chert" as follows:

Mineral Aggregate. — An aggregation of pieces of gravel, crushed stone, slag, sand, or certain other materials of mineral composition graded to size.

Chert — Descriptively, chert is a fine-grained rock which is characterized by hardness (scratches glass, is not scratched by a knife blade), conchoidal fracture in dense varieties, the fracture becoming splintery in porous varieties, and a variety of colors. The dense varieties are very tough and are usually gray to black, or white to brown in color, less frequently green, red or blue, and have a waxy to greasy luster. The porous varieties are usually lighter in color, most frequently being white or stained yellowish, brownish, or reddish, and have a chalky surface. Dense red and in some cases dense yellow, brown, or black chert is sometimes called "Jasper." Dense black and in some cases dense gray chert is sometimes called "Flint."

Mineralogically, chert is composed of silica (SiO_2) in the form of chalcedony (microcrystalline fibrous quartz and interstitial or microfibrous amorphous silicaopal), usually with cryptocrystalline quartz and opal. The determination of which form or forms of silica are present requires careful determination of optical properties, absolute specific gravity, or both.

Geologically, chert occurs most frequently as nodules or bands in limestones and in sands and gravels derived from such rocks.

The tentative method of test for soft particles in coarse aggregates follows a procedure of the Public Roads Administration, described to the Society a year or two ago. It is a scratch test for hardness using a special brass rod. Although "soft" particles are referred to in many specifications, this appears to be the first attempt to define a soft particle by a method of test.

C. Martin Duke, assistant professor of engineering, University of California, had a paper on "Engineering Properties of Coral Reef Materials," with special reference to the aggregate-making properties of the coral reef materials used by the U. S. Navy on the island of Guam in the Pacific. Its chief interest to the aggregate and concrete industry in this country would appear to be in the information it gives about the formation of limestones and how they acquire their special characteristics. Much of our limestone had its origin as coral reefs or something similar.

Floyd O. Slate, research chemist, Joint Highway Research Project, Purdue University, discussed "Chemical Reactions of Indiana Aggregate in Disintegration of Concrete." The Indiana State Highway Department has had considerable unfavorable experience with pavement concrete made with certain cherty limestones and chert gravel aggregates. Since it has become fashionable to attribute all such failures to reactive aggregates and high alkali cements, this research was made specifically to find out whether or not chemical reactions could account for the disintegration in these instances. The conclusions are that for the aggregates studied no appreciable chemical reaction was found which would cause disintegration of concrete.

The aggregates were subjected to chemical analyses, petrographic studies, expansion-bar tests, bomb tests, pot tests, microscopic examination of disintegrated concrete — in fact to every study method designed to show aggregate reactivity. The data developed will prove of general interest. There seems to be ground for believing that the physical characteristics of the material—particularly the kind and amount of porosity—are more likely causes of concrete disintegration in Indiana than chemical reactivity. The service records of many of these aggregates are included and are, in many instances, at variance with the results of laboratory tests.

Wetting and Drying Test

C. H. Scholer, professor of applied mechanics, Kansas State College, described "A Wetting-and-Drying Test for Predicting Cement-Aggregate Reaction." Prof. Scholer concluded that the "test is much more sensitive in that many combinations which do not show reaction under the commonly accepted mortar bar tests will show abnormal expansion in the wetting-and-drying test.

"Whether or not all of these expansions are directly the result of cement aggregate reaction may be questioned, but it is believed that the test is highly significant and that where appreciable expansions occur under this test, there is considerable danger of serious reaction in such concrete combinations. The test is peculiarly valuable in that it may be used with coarse aggregate combinations and also because it shows the significant effect which various coarse aggregates may have upon the so-called cement-aggregate reaction. Some of the data indicate that the commonly accepted alkali limitations may not be very highly significant, and probably other elements than alkali alone are potent factors in determining the extent of the cement-aggregate reaction."

Design of Concrete Containing Entrained Air

A subject of considerable interest to ready-mixed concrete manufacturers, "The Design of Concrete Mixes Containing Entrained Air," was covered in a paper by Thomas H. Thornburn, research assistant professor in civil engineering, University of Illinois. The paper is intended specifically to show how the mortar-voids method of design can be adapted to mixes containing entrained air. The following conclusions are of general interest:

"(1) A study of the characteristics of mortar-voids curves determined for mortars containing entrained air has indicated that these curves cannot be used as a reliable basis for the design of concretes containing entrained air. This is due to the fact that the amount of air entrained in the mortar is determined by a variety of factors, such as method of mixing, temperature of the mix, and richness of the mix.

Here's a message every QUARRYMAN can read . . . profitably!

NATURALLY, you want to be successful. You want to make money. And what better way is there to *make* money than to save money on your truck transportation?

You can save *plenty* of money with trucks that fit your job . . . Dodge *"Job-Rated"* trucks.

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So have a talk with your Dodge dealer. For remember . . . *only* Dodge builds *"Job-Rated"* trucks!

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Furthermore, it has not yet been found possible to entrain in the richer mortar mixes the amount of air required for design purposes.

"(2) A study of the strengths of controlled mortar and concrete mixes containing entrained air has indicated that within the range of strengths commonly used for pavement concrete a significant linear correlation exists between the strength at a given age and the cement-space ratio. Furthermore, the linear relationship very closely approximates one used by the Illinois Division of Highways in its present design procedure. Apparently the relationship between compressive strength and cement-space ratio is the same whether the voids in the mix are completely filled with water or whether they are filled partly with water and partly with air.

"(3) It is possible to prepare theoretical mortar-voids curves incorporating any desired percentage of entrained air by a series of computations based on the mortar-voids curves determined experimentally from a series of mortar-voids tests on any given sand and cement.

"(4) These theoretical curves may be used to determine the correct proportions of concrete materials required to produce a mix of any desired strength provided the air entrained in the concrete mortar corresponds to that assumed in the preparations of the theoretical curves. When the air-entraining agent is added to the batch at the mixer it is not too difficult to produce any desired air content under a given set of conditions.

"(5) It is not known whether this method of design may be applicable for concrete mixes containing cements with i n t e r g r o u n d air-entraining agents. It seems possible that the theoretical curves could be prepared from basic data on the cement without the interground agent if such cements could be obtained from the manufacturer. However, it would not be possible to have positive control over the amount of air entrained in the mix.

"(6) Tests on a series of mixes prepared in the laboratory according to the suggested method of design indicate that the method is sound and that the factor of safety provided need be no greater than that used in the design of standard portland-cement concrete, provided the air content of the concrete is subjected to adequate field control."

Lime Standards

Committee C-7 on Lime reported it had reviewed the various standard specifications of the Society for lime in the different industries and recommended they be continued in their present status without change. The committee also recommended that present tentative specifications for (a) Normal Finishing Hydrated Lime, (b) Special Finishing Hydrated Lime and (c) Hydrated Lime for Masonry purposes be advanced to Standard Specifications. The committee adopted a definition of "Liming Materials," used in agriculture, which follows closely the definition given in the Ohio statute covering the sale of agricultural liming materials.

Refractories Laboratory

ABOUT 30 EDITORS and press representatives were the guests of General Refractories Co. at the formal opening of its new research laboratory located at Baltimore, Md., on June 29. Among those present were representatives of the leading newspapers in the New York - Philadelphia - Baltimore area, together with men from *Fortune*, *Newsweek*, *Business Week* and similar publications as well as editors of trade publications who serve those industries that are large users of refractory materials.

A special car on the Pennsylvania railroad left New York City for the opening, and representatives from Pittsburgh, Chicago, and the more western cities converged at Philadelphia to meet this train. The entire group then proceeded to Baltimore where chartered buses took the men to the new laboratory. The program was well planned and executed. A break in the heat wave added to the enjoyment of the trip.

Object of the program was twofold: to give those with an engineering background a brief glimpse of the technical processes involved in developing and manufacturing high temperature resisting materials, and through the various press agencies, to acquaint the layman with the importance of refractory brick and to bring to his attention that it is a basic commodity.

Importance of Refractories

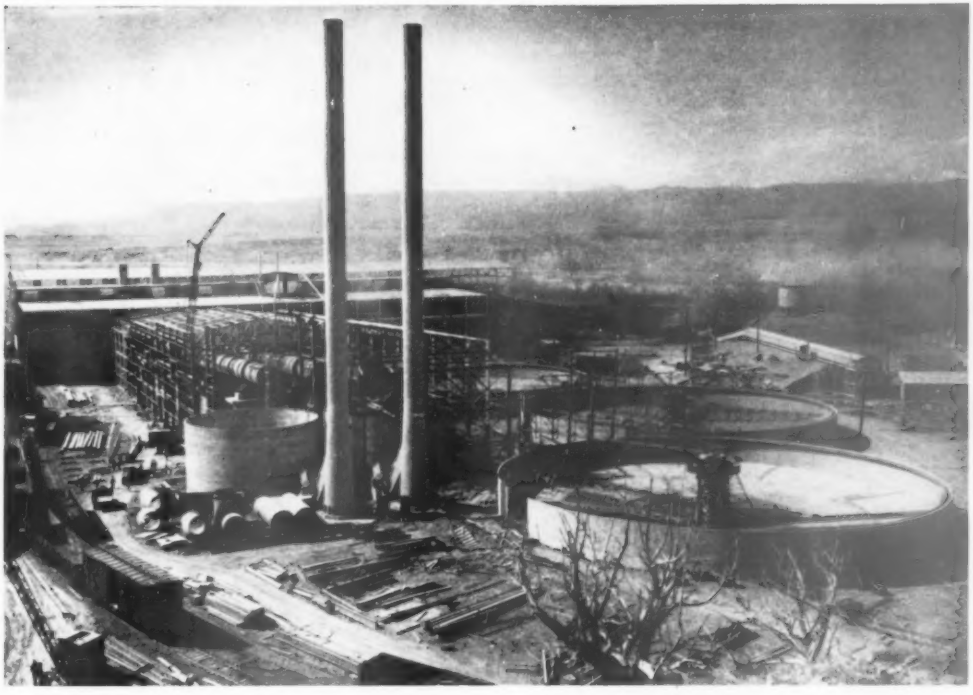
As Dr. Russell P. Heuer, vice-president in charge of engineering and research pointed out, the mere opening of another research laboratory is no earth-shaking event, but, that through research better refractories can come, and, practically every improvement that may come in the future to the steel, glass, copper metallurgy, portland cement manufacture, or lime industries only can come *after* the discovery and production of a better refractory, or fire-resisting product. That General Refractories Co. has seen fit to invest over a half-million dollars for adequate research facilities is an important milestone in the growth of the industry, and the products of their research can affect the lives of us all. Thus, it was pointed out that practically every producer of construction and fabricating materials has a stake in this new Grefco laboratory.

Purposes of Project

To help carry out the two-fold purpose of the project, and for the enlightenment of those in attendance, each was given a bound volume of the company's new book *Refractories*. This excellent book of almost 300 pages is a refreshing piece of descriptive and technological literature from both a layman's and an engineer's standpoint. It tells the story of refractories, how they are made, their use and of the history of the industry. It is printed on paper of excellent grade and weight and the numerous illustrations, both in black and white and in color, are appropriate and well arranged. The second, and equally im-

(Continued on page 208)

Dr. Russel P. Heuer, vice-president in charge of research, General Refractories Co., cutting ribbon to officially open new refractories research laboratory, located at Baltimore, Md.



View of the Ideal Portland Company's Cement Plant at Portland, Colorado, under construction. This plant was designed and constructed by Stearns-Roger in accordance with customer's specifications. It was completed and placed in operation September 24, 1948.

A duplicate of the Portland plant was built concurrently at Devil's Slide, Utah. Both plants represent the latest in design and construction, and are considered to be the most modern Cement Plants in existence. Each has a daily capacity of 4,000 barrels of finished cement.

UNDIVIDED RESPONSIBILITY

- ENGINEERING
- DESIGNING
- MANUFACTURING
- CONSTRUCTION

● *Stearns-Roger engineers will be glad to discuss your problems of engineering and construction with you, and to outline a program to meet your requirements.*

Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO

Electric powered shovel loading 15-ton end-dump truck powered by 190-hp. diesel engine

Direct Firing with Tube Mills

(Continued from page 131)

device. If it should drop some 100 deg. from the 1500 deg. F. which is considered optimum, the operator knows that his kiln is cooling off and he is able quickly to slow the kiln possibly 10 r.p.h. until he gets back on the desired reading. Extremely wet coal might be the reason and the effect would also be reflected in a drop of several hundred degrees in the temperature of the secondary air as measured by thermocouple in the windbox of the clinker cooler. That figure should be 1200 to 1300 deg. F.

Kiln No. 6 and the others as well have very few automatic features but, by close knowledge of kiln conditions, are operated very uniformly and with good refractory experience. There is practically no difficulty with either mud rings or slag rings.

Kiln No. 6 as well as the others is being pushed hard for production and, as a result of the high draft carried and because of the nature of the raw materials, dust losses tend to be very high. The slurry does not have a tendency to produce strong nodules so there is less than the average tendency to build mud rings when pushing a kiln. The slurry, when dried, is unplastic, on the other hand, which results in high dust loss.

Some of the chains have been removed to cut stack dust loss and the company is now in process of installing a Cottrell stack dust collector to handle the gases from all six kilns which will then exhaust through a single 356-ft. concrete stack. The collector will consist of two 3-unit electrical precipitators each with a 25-duct rod curtain assembly and 20-duct pocket electrode assembly. Design is for 750,000 c.f.m. of gases to enter the collectors at 400-450 deg. F.

It is anticipated that dust will be returned to the kilns in considerable amount. Consumption of raw materials has increased from 555 lb. per bbl. of clinker to 585 lb. since the kilns have been pushed for high production, so the dust loss is 35-40 lb. per bbl. of clinker produced.

No. 6 kiln at present is requiring 900,000 B.t.u. per 350-lb. bbl. of clinker which is about 70 lb. of coal; the four 354-ft. kilns are operating at 1,100,000 B.t.u.; and the short kiln at 1,300,000-1,400,000 B.t.u.

Trenton limestone is a soft rock quarried at the rate of 6000-7000 tons per day. The ledge is drilled with 6- and 9-in. well drills, and electric shovels of 5- and 3¼-cu. yd. capacity load the stone into eight 15-ton Euclid trucks powered by 190-hp. G.M. diesels for delivery to the crushing plant adjacent. The stone is crushed to 6 in. top size through a 54-in. Traylor gyratory crusher and then put through two hammermills in parallel for reduction to 65 percent minus ⅝-in. preparatory to grinding.

The stone is a true cement rock and has an average analysis of 41.8 percent CaO, 12.8 percent SiO_2, 4.02 percent Al_2O_3, 1.69 percent Fe_2O_3, 2.3 percent MgO, and an ignition loss of 35 percent. Possibly 10,000 tons of sandstone and 25,000 tons of high calcium carbonate stone are added to the mix in a year, when manufacturing high early strength cement.

Raw Grinding

Raw grinding capacity was increased two years ago by installation of two 7- x 46-ft. 3-compartment Unidan mills driven by 1100-hp. synchronous motors which are equipped with power factor meters. Five Uni-Kom mills driven by 800-hp. motors complete the raw grinding department. Unidan mills carry a ball charge of 76.5 tons graded from 5- to ⅝-in. size. The mills have a ⅝-in. rubber launder lining between the wearing liner and shell. Reciprocating feeders deliver feed material to belt conveyors from the raw material stockhouse to the mills. The grind is 90 percent minus 200-mesh, in open circuit, and water content of the slurry as fed the kilns is 34 percent.

Slurry is pumped to correcting tanks, followed by re-handling into mixing basins and storage basins. There are six correcting tanks of 1600 bbl. each, the mixing tank holds 7000 bbl. and two storage basins have 18,000 bbl. capacity each. All are agitated mechanically and pneumatically. Through use of high lime slurry held in one or two tanks, and blending, a hold point of 41.5 percent CaO is attained for kiln feed.

Finish Grind

Clinker is ground into cement by 15 kominuters followed by 22-ft. straight tube mills. Closed circuit grinding is not practiced since fineness for standard portland cement in Canada is only 82 percent through a 200-mesh sieve. However, high early strength cement, which is in comparatively light demand, must be ground to 2700 surface in closed circuit.

Plants - Personnel

Canada Cement Co., Ltd., also operates plants at Hull, Quebec; Belleville, Ont.; Port Colborne, Ont.; Exchaw, Alberta; and Fort Whyte, Manitoba.

A major expansion program has just been completed at Belleville, involving installation of a second 11-ft. 3-in. x 10-ft. x 11-ft. 3-in. x 455-ft. Smidth kiln and doubling of both raw and finish grinding departments to increase production by 4000 bbl. per day. The 42-in. gyratory crusher has been re-located in the quarry, trucks have been installed to replace locomotives and a 42-in. belt conveyor to transport stone from the crushers. Four gyratory reduction crushers produce ballast at this plant. Other developments include six storage and correcting tanks, a new clay wash mill, two new raw grinding mills, and three ball mills and air separators in the finish end.

Officers and personnel include J. D. Johnson, chairman; J. M. Breen, president and general manager; John Narsted, vice-president in charge of production; V. C. Hamilton, general superintendent; and A. S. Dies, chief chemist.

Taylor Kennedy is superintendent at Montreal, L. E. Shipley is plant chief chemist; and A. O. Drysdale and J. A. Grosskurth, assistant superintendents.

it DIGS...it LOADS at tremendous savings

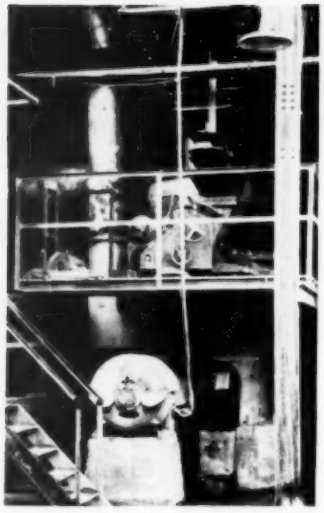
Whether you need it for excavation work or loading from stockpiles or both, you need the new low production cost of the Dempster-Diggster. Here is the only small shovel that works on a hydraulic, simultaneous or independent crowd and hoist action and completely eliminates tractive effort in loading with wheels. Its variable crowd action at any dipper position means the Dempster-Diggster can dig lower . . . 15 inches below grade. Exclusive hoisting action means it can dig higher . . . digs out a 15 ft. bank. It's the only small shovel featuring such speed and mobility . . . travels at truck speeds on the road . . . gets in tight places on big jobs, freeing large shovels for heavier work. Ideal for the small and medium size excavation jobs yet powerful and fast enough for big jobs.

Stockpiling or loading work is easy for the DEMPSTER-DIGGSTER. Its speed . . . its 15 ft. turning radius . . . its extraordinary dumping reach help the Dempster-Diggster complete the average loading job in an amazingly short time. Dempster-Diggster buckets are easily interchangeable and are availab'e in three sizes. 1 cu. yd. (heaped) with hardened steel teeth for digging . . . 1½ and 2 cu. yd. for loading and stockpiling work. Power is supplied by a heavy duty gasoline or diesel engine. Hoisting, crowding, steering and braking are all 100% hydraulic. For complete information, write today for Folder Number 8154.

Large photo above shows Dempster-Diggster loading crushed stone. Note how independent crowd and hoist action permits bucket to follow the slope of the material. At right, top: Digging out high bank. Right, center: Closeup of 1 cu. yd. (heaped) digging bucket. Right, bottom: Dumping crushed stone into truck.

DEMPSTER BROTHERS INC.

389 N. KNOX, KNOXVILLE 17, TENNESSEE



Bowl mill which direct-fires new kiln

Grinding

(Continued from page 139)

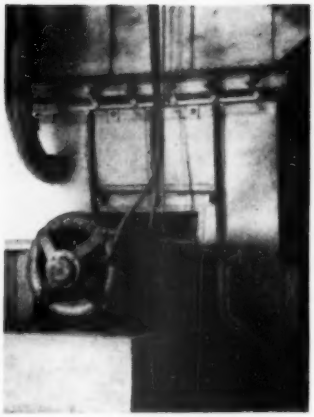
gases are pulled through the fan, low gas velocities were desired to minimize abrasion of the fan blades, and greatly over-sized induced draft fans were selected which can be operated at low speed of rotation. They are Sturtevant double-inlet fans of 50,000 c.f.m. capacity each, driven from 75-hp. motors. Actually, they are coasting at speeds far below their capacity. Kiln hood draft is held at .02 in. and regulated by adjustment to the louvre damper. Draft can be increased also by speeding up the induced draft fan.

Dust Collection

The Cottrells are effective in recovery of something over 95 percent of the dust from the exit gases; however, no positive check has yet been made. A Fuller-Kinyon system returns the dust into the raw mill air separator circuit. Dust settled in the hoppers of the waste heat boilers and economizers is conveyed and elevated to the kiln feed bins.

Quarry

Haul to the plant from the quarry averages 2½ miles and is done by rail. Average trainload is ten cars holding 15 tons of stone to the car. Excavation is by a 4-cu. yd. Bucyrus-Erie electric shovel. Methods of drilling and blasting have been changed to the use of the Atlas Rockmaster split-second system employing the electric switch and 11 delays, and with excellent results in reducing secondary blasting. Blast holes are driven to a staggered pattern and great tonnages of stone are broken down and maintained in front of the face as a buffer to protect trackage. The raw



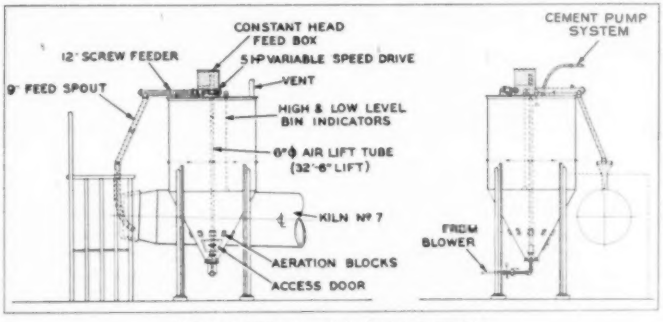
Induced-draft fans have great over-capacity, which permits slow speed and therefore reduces abrasion on blades

mill employs two-stage, closed-circuit grinding.

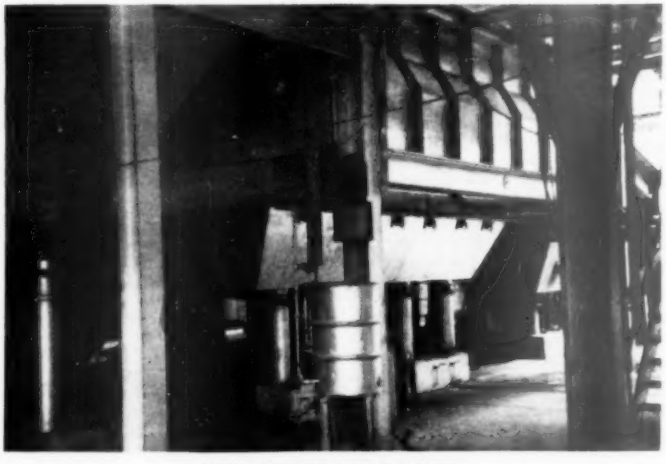
Personnel

H. D. Baylor is president of Louisville Cement Corp.; Ray K. Hartsock is vice-president in charge of operations; Thomas McDonald is chief engineer; D. E. Willingham is general superintendent; and Wallace H. Leach is chief chemist. Operating offices are at Speed, Ind. The company also has a plant at Akron, N. Y., for the manufacture of Brixment Masonry cement and a lime plant at Milltown, Ind. Commercial crushed stone is produced at Speed and at Milltown.

Feeder which regulates flow of clinker (with gypsum) into preliminary 9- x 15-ft. ball mill



Sketch of constant head feeder for rotary kilns



One of three new waste-heat boilers

HOW a — LINK-BELT SPEEDER Will Boost Your PRODUCTION

Back of every Link-Belt Speeder design feature is a wealth of experience which says, "This principle assures efficient action and freedom from trouble. Hence—this principle protects the profits by avoiding excessive operating and upkeep expense".

Let the nearby Link-Belt Speeder distributor show you the rest of these distinctive Link-Belt Speeder "Profit Protectors".

FEATURES LIKE THESE GIVE THE LS-85 "SUPER" ¾ YARD SHOVEL-CRANE HIGH PRODUCTION AND LOW OPERATING COST!

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- Ample power unit from the manufacturers standard production. Choice of three diesel engines.
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- Efficient, dependable, heavy duty swing and travel mechanism.
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No. 48 WEMCO Sand Preparation Machine.

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WEMCO Sand Preparation Machines are specifically designed to produce:

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  ...with maximum recovery of desired sands. A machine to meet every need. Controls excess fines, slime and medium fractions.

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  ... exclusive WEMCO design provides maximum sand raking and overflow capacities. Automatic operation assures continuous production with minimum attendance.

Reduced operating and maintenance costs are assured – WEMCO Sand Preparation Machines are noted for simplicity of operation and durability of construction.

Henry J. Kaiser Co., installation of WEMCO Sand Preparation Machines at Radum plant.

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WEMCO Sand Pumps and parts are available for immediate shipment. For prompt delivery call your nearest WEMCO office.

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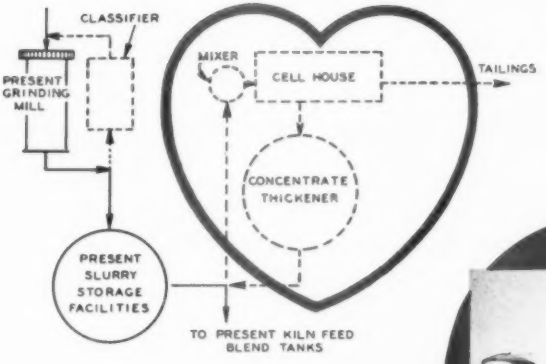


THE HEART OF MODERN CEMENT PLANT FLOW SHEETS

The installation of the Flotation Process, to beneficiate your raw materials, does not necessarily mean the erection of a complete new plant.

It can be installed in your present flow sheet without disrupting your production schedule.

Your existing equipment is utilized to the best advantage.

Our laboratory and pilot plant at Catasauqua are fully equipped to make complete investigations of your materials. Based upon these investigations, by our mining and chemical engineers, we design, equip, and supervise the erection of complete cement raw-material processing plants. Write us for particulars. Preliminary examination made without any obligation to you.

Patent rights outside North America controlled, test work undertaken, and equipment furnished by F. L. Smidth & Co., A/S Copenhagen.

RESULTS OF FLOTATION

Quarry costs are reduced by using "Run of Quarry" instead of "Selective Quarrying"

Beneficiation of low-grade stone lengthens the life of your quarry

Elimination of purchasing high-grade limestone

All types of cement can be manufactured from the same quality stone

Low-grade limestone areas, near the market, heretofore not considered usable for cement manufacture, can now be utilized

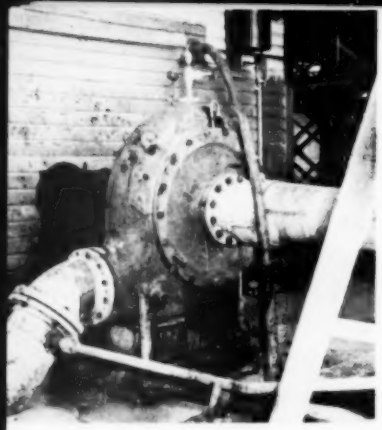
The flotation rejects are often marketed as a by-product

In many instances, the saving in quarry operation alone, more than offsets the operating cost of flotation.

S-7

SEPARATION PROCESS COMPANY

CATASAUQUA, PENNSYLVANIA



Delivering tailings from the new plant to the tailings pond, this 12-in. pump is powered by a 350-hp. motor

Flotation

(Continued from page 108)

acids, fuel oil, kerosene, etc. Adequate facilities are available for mixing and preparing the various flotation chemicals (caustic and amines), etc. The reagents flow to a specially-designed pump that rests at ground elevation under the flotation plant.

The reagent feed pump is a series of small piston-type pumps all driven from the same power source. By a special design, the length of the stroke of each piston pump regulates the amount of liquid reagent handled by that particular piston. Long steel rods with heavy threads at the pump end extend up into the flotation room, so that the operator there can adjust the amount of reagents used by simply making use of the threaded rod to shorten or lengthen the stroke of the pump.

The bins in the plant are being equipped with company-designed bin indicators and these units, as well as the above mentioned reagent feed pump, were designed by E. J. Ellis, metallurgical engineer for the company.

Flotation Cleaner Cells

The flotation cleaner cells used on the silica float are a bank of six cells, MS, No. 8 Airflows. Air for the Denver cells is supplied from a low pressure blower that is an integral part of the flotation cell, and the air from this blower descends to the impeller by means of an enclosure surrounding the vertical impeller shaft. In the flotation room is a large Square D switchboard that controls all the power units in this section of the plant.

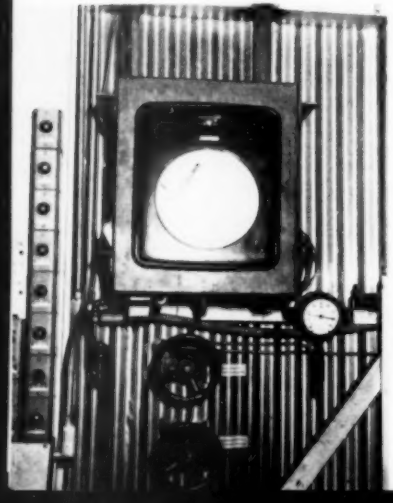
Fresh water for the entire operation is supplied from a 12-in. Peerless deep-well pump from a depth of 1200 ft.

Personnel

Officers and personnel are as follows: W. H. Gabeler, manager, Phosphate Rock Division, Davison Chemical Corp., with offices at Bartow, Fla.; A. T. Cole, chief engineer; E. C. Weichel, Jr., superintendent of operations; J. M. Harris, personnel manager; J. W. Pamplin, project engineer; E. J. Ellis, metallurgist and designer of the flotation reagent pumps and bin indicators; B. P. Jones, mine superintendent of Pauway No. 4; W. A. Allen, assistant superintendent; W. A. Lanier, assistant superintendent; A. K. Wood, recovery plant foreman; J. A. Bender, recovery plant foreman; J. C. Kennon, assistant to the superintendent; and Arthur Sewell, timekeeper.

Flotation plant operators are L. L. White and B. H. Bell. The reagent tenders are J. D. Szanyi and J. W. Morrison. Roy N. Hill, Lakeland, Fla., was construction superintendent for Western-Knapp Engineering Co. Dr. E. W. Greene is in charge of Minerals Separation North American Corp. at Lakeland.

Load indicator and controls for 56-in. double-pitch, duplex, submerged-type spiral



Instrumentation

(Continued from page 143)

draft at the hood, which will eliminate air infiltration and, at the same time, prevent damage to the hood and seal by overheating.

While this equipment in its entirety has not as yet been placed in service on any kiln, it follows the basic principles of combustion control which have been found most satisfactory for boilers, and many types of direct-fired industrial furnaces, and there need be no hesitancy about accepting it. All of the components have been proven individually, and the general arrangement has been proven on other services. Only the particular arrangement as applied to a kiln is new.

This and other jobs which will go into service in the next few months will mark another stride in the development of proper kiln control, and will point the way to improved performance of kilns.

As shown on the diagram, compressed air is used as the control medium, as this has been found to be a satisfactory medium for operation around rotary kilns. Electrical contacts present a severe problem in maintenance, and where the atmospheres are dusty, should be avoided wherever possible. Pneumatic control, the type most generally used for all industrial control, is particularly well suited to kiln service, in that it is largely self-cleaning and is not affected by dust.

Despite the rapid strides which have been made and the advances which can be readily foreseen, instrument and control manufacturers are continuing to develop improved types of instruments, and new instruments for special purposes. No industry can consider itself today as having the ultimate in automatic control, and advances can be expected in all of them. For the first time, complete equipment is now available for optimum control according to present day knowledge, and operators can take advantage of this equipment for a moderate expenditure, and without the necessity of major overhaul or replacement of existing capital equipment. The instruments and controls available are adaptable to all types of kilns, both old and new, all types of fuel, and for all types of product.

U. S. Slate Production

SLATE PRODUCTION in the United States in 1948 decreased 9 percent in quantity over the preceding year but increased 10 percent in value for the same period. Production totaled 799,400 short tons in 1948, valued at $12,880,929. Sales of roofing slate amounted to 218,650 squares in 1948. Structural and sanitary slate, blackboards and school slates showed considerable gain in both quantity and value.

Mill stocks suffered a slight decline in 1948 over 1947. Grave vaults, covers and billiard-table tops declined as much as 40 percent in quantity and electrical slate declined as much as 25 percent in quantity and 7 percent in value.

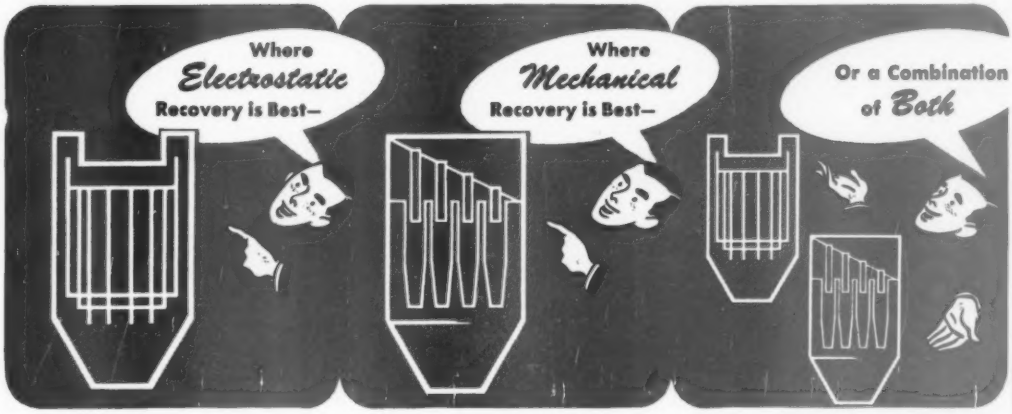
Refractory Brick

AN AVERAGE of 10,000,000 refractory brick is used per year by Republic Steel Corp., at its Canton, Ohio, plant, for building and lining its open hearth and electric furnaces, steel ladles, soaking pits, coke ovens, and other equipment. About 900,000 brick are needed to build an open hearth furnace. Rebuilding a furnace, which must be done about every three months, requires about 180,000 brick. About 6500 brick are required to replace an electric furnace roof, done about twice a month. Sidewall rebuilding must be done about every three months, requiring 7500 additional brick. About 12,500 brick are used in the bottom of each furnace.

This is the UNIQUE ADVANTAGE

Western Precipitation provides for simplifying YOUR Dust Recovery Problems . . .

If you are not sure whether yours is a job for Cottrell or mechanical separation methods, you'll get an unbiased recommendation from Western Precipitation Corporation because this organization designs, engineers and installs BOTH!



THE *COTTRELL* ELECTRICAL PRECIPITATOR

Western Precipitation is the organization that pioneered the first commercial application of the now-famous Cottrell Electrical Precipitator. And its unique advancements and refinements in the basic methods, developed through more than 38 years of first-hand experience in Cottrell installations, assure you of the most modern in electrostatic recovery equipment from Western Precipitation Corporation. Cottrells handle dust, fume, fly ash, mists and other suspensions with high efficiency.

THE *MULTICLONE* MECHANICAL COLLECTOR

Companion to the Cottrell is Western Precipitation's widely used *Multiclone* equipment which offers far-reaching advantages in the mechanical separation of solids from gases. Its unique vane design makes possible multiple *small*-diameter separating tubes that combine high recovery efficiency with maximum compactness, minimum maintenance and wide-range adaptability to varying installation requirements. For mechanical recovery of solids, *Multiclone* is unsurpassed in operating efficiency, economy and installation simplicity.

COTTRELL AND MULTICLONE

And here's a priceless advantage provided by Western Precipitation Corporation . . . Frequently there are recovery problems where maximum efficiency and economy in first cost are obtained by using *Cottrell* and *Multiclone* equipment working together. There are many such recovery jobs—fly ash is one, perhaps *yours* is another—and you can get such a combination installation from one organization, under one responsibility, with one overall guarantee by bringing your recovery problem to Western Precipitation Corporation.

Send for these MULTICLONE and COTTRELL booklets!

REGARDLESS OF YOUR RECOVERY PROBLEM OR YOUR LOCATION

you can benefit by Western Precipitation's leadership and long experience in the science of recovering suspensions of all kinds—both liquid and dry—from gases, hot and cold. Western Precipitation Corporation installed the first successful Cottrell which is still in operation after 35 years of service. No matter what your industry, Western Precipitation is prepared to serve you in *all* parts of the world. Write, wire or call our nearest office.

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MULTICLONE Collectors
TURBULAIRE Spray Dryers

...in all parts of the U.S.A. and foreign countries.

Crushing and screening plant operated by two diesel engines. Note unusual gravity flow arrangement and enclosures over storage bins to increase capacity at plant of Cheney Limestone Co., Bellevue, Mich.

Durability of Concrete

(Continued from page 135)

ently speeded by an excess of lime. Whatever form or combination this excess of lime may take, its presence, while it probably accounts for the early strength, seems to be a handicap to the lasting properties of the concrete unless there is an active siliceous admixture or fine aggregate for it to react with or to become attached to. In other words, we can have a portland cement in which the lime is made soluble in greater amount or at a faster rate than the reactive silica contained in the cement itself can take care of.

We do not have a great deal of faith in the assumed mineralogical constitution of portland cement based on calculations from the oxide content of the product as determined by chemical analysis. Too many assumptions are necessary in regard to all the processes involved in making the clinker. For example, it is generally assumed that all the silica present has been combined in certain proportions with one or more of the other constituents. Yet there is a great deal of experimental evidence that silica in the form of quartz is very little acted upon by lime, no matter how finely ground the quartz may be, at any temperature attainable in cement manufacture. The importance of having the silica of the raw mix in a "nascent" form was recognized by such early researchers as A. V. Bleininger, author of "The Manufacture of Hydraulic Cements," Geological Survey of Ohio, 1904. Bleininger, as a ceramic chemist, was particularly capable of discussing clays and shales, and he made it clear that there is a vast difference in the relative reactivity of silica in various kinds of clay and shale and practically no reactivity in quartz. Many cement manufacturers have learned this by experience, but apparently no allowance is made for silica in cements which is still partly unacted upon, and is there perhaps chiefly as very fine grained quartz. If this was not acted upon by the lime in the formation of clinker in the kilns, it is not likely to be acted upon by the lime in the process of hydration, unless there is enough alkali present to put some of this quartz in a nascent form, either in the kiln or in the hydration.

It seems possible, therefore, that there can be portland cements which contain nascent silica that is too readily available; or conversely, cements in which the lime or calcium hydroxide is not made available as rapidly as the silica; that is the timing is not correct. It follows that alkalies might be very useful in some cements which depend largely on quartz for their silica content, but detrimental in cements already adequately supplied with nascent or reactive silica. That kind of reasoning would explain why some portland cement concretes are undeniably improved by the addition of a small percentage of hydrated lime. In other words, there must be a balance at all times between the reacting basic and acidic ingredients. A coarsely ground, well graded cement should be helpful in maintaining such a balance.

Returning to the possible influence of the composition of the cement, it is of course well known that the dicalcium silicate ($2\ CaO.SiO_2$) hydrates much more slowly than the tricalcium silicate ($3\ CaO.\ SiO_2$). The goal in making modern American portland cement appears to be to attain the highest possible content of $3\ CaO.SiO_2$, but European manufacturers while they appear to appreciate the importance of some $3\ CaO.SiO_2$, also seem to believe too much is not desirable. The permissible lime ratio of 1.7 in these European specifications is considerably less than was supposed to have been used in most of our early American portland cements. The usual figure was 2, and some had more. This formula is not used any more apparently, in this country, but probably present-day cements show a ratio by the formula of appreciably more than 2.

Taylor and Thompson give a chemical analysis of Lehigh Valley portland cement made by W. F. Hillebrand in 1902, which probably can serve as well for any year in the first decade of the present century as follows:

SiO_2	21.31 percent
Al_2O_3	6.89 percent
Fe_2O_3	2.53 percent
CaO	62.89 percent
MgO	2.64 percent
SO_3	1.34 percent
Ignition Loss	1.39 percent
Other	0.75 percent

Using this analysis to estimate the mineral constituents of the clinker by the method of Dr. Bogue, we have: Free lime as $Ca(OH)_2$ represented by the loss on ignition, taken as about 1 percent CaO. [None of the early portland cement analyses gave figures for free CaO, but they were known to contain considerable $Ca(OH)_2$ from quenching the clinker with water and from outdoor storage of the clinker and from the aging or seasoning of the cement. We assume, therefore, that the ignition loss represents chiefly water from $Ca(OH)_2$.]

(Continued on page 184)

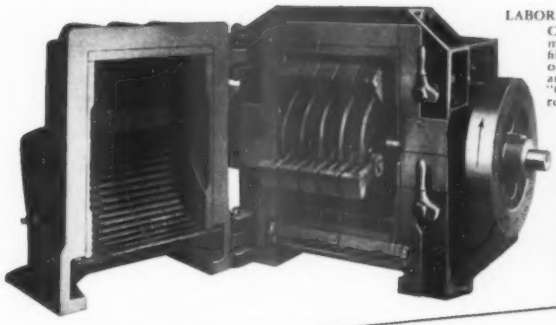
1.34 percent SO_3 = 1.34 x 0.70 = 0.94 percent CaO
Free CaO = 1.00
Total 1.94

Remaining CaO = 62.89 − 1.94 = 60.95 percent
2.53 percent Fe_2O_3 = 2.53 x 0.64 Al_2O_3 = 1.62 percent Al_2O_3
= 3.11 x 1.40 percent CaO = 4.35 percent CaO
= 3.11 x 3.04 percent $4CaO.Al_2O_3.Fe_2O_3$ = 9.5 percent $4CaO.Al_2O_3Fe_2O_3$

Remaining Al_2O_3 = 6.89 − 1.62 = 5.27 percent
5.27 percent Al_2O_3 = 5.27 x 1.65 percent CaO = 8.7 percent CaO
= 5.27 x 2.65 percent $3CaO.Al_2O_3$ = 13.96 percent $3CaO.Al_2O_3$

Remaining CaO = 60.95 − 4.35 − 8.7 = 47.9 percent

Percent $3CaO.SiO_2$ = 4.97 P − 7.60 Q
Percent $2CaO.SiO_2$ = 8.60 Q − 3.07 P
where P = percent lime content remaining for silicate formation and Q = percent of silica.



LABORATORY SWING-SLEDGE MILLS

Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.

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Assure Quality of Products

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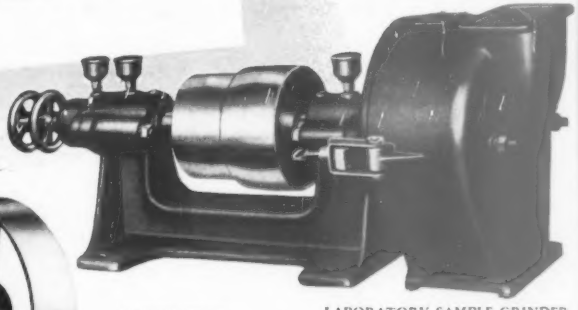
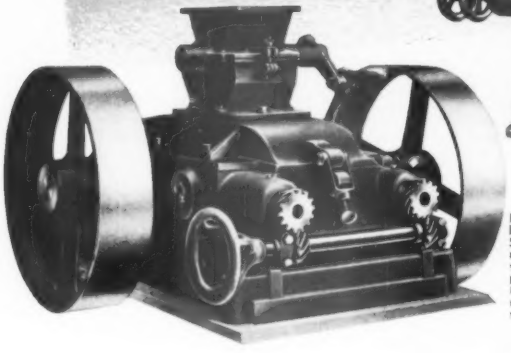
LABORATORY JAW CRUSHERS

Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 or 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.





LABORATORY CRUSHING ROLLS

First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited outputs. Range of output for the 8 x 5 size is from $\frac{1}{2}$ in. to 20 mesh — and for the 12 x 12 size from $\frac{3}{4}$ in. to 20 mesh.

LABORATORY SAMPLE GRINDER

Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

The only sure way to maintain strict quality of products is laboratory control . . . and that calls for accurate sampling.

Sturtevant Laboratory Equipment meets the exacting requirements of laboratory work. They are fast and accurate . . . provide true samples.

Rugged and dependable, Sturtevant equipment actually has all the features of full size machines plus extra accuracy and wider range of adjustment. The "Open-Door" accessibility permits quick, thorough cleaning . . . prevents the possibility of previous batches from contaminating new samples.

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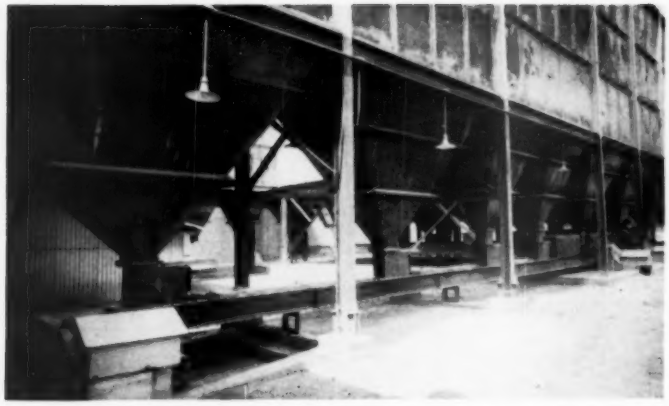


Screw conveyor, bottom, collects dust for return to Leeds, Ala., plant of Universal Atlas Cement Co.

Durability

(Continued from page 182)

The compound composition of this cement would therefore have been:

$4CaO.Al_2O_3.Fe_2O_3$	= 9.5 percent
$3CaO.Al_2O_3$	= 13.96 percent
$3CaO.SiO_2$	= 33.04 percent
$2CaO.SiO_2$	= 36.21 percent

This does not include the gypsum (probably about 3 percent), the 2.64 percent of MgO, the CO_2 lost on ignition, the alkalies, etc. of at least 2½ percent.

By such an analysis this would have been a high alumina portland cement—too high probably to have been usable. The proportions of $3CaO.SiO_2$ and $2CaO.SiO_2$ were at most about equal, for that appears to have been the aim at that time. One possible explanation appears to be that in the absence of the "hard burning" now deemed necessary to attain this distribution of lime, some of the alumina and iron compounds were not those shown but were more in the nature of lighter burned puzzolans, with less combined calcium oxide, leaving more for combination as one silicate or the other.

A more logical proportion of dicalcium silicate to tricalcium may be estimated by assuming that no tricalcium silicate would be formed until all the calcium requirement for the dicalcium silicate had been satisfied. This would require 3.07 x 21.31 = 65.4 percent of $2CaO.SiO_2$ and, since the total calcium silicates comprise only 69.25 percent of the cement, only 4.15 percent would be tricalcium silicate. Apparently, then, the early hardening was caused almost entirely by the alumina compounds, and the slow gain in strength during the intervening 40 years was due to the hydration of the dicalcium silicate, with possibly the small amount of calcium hydroxide set free combining with the uncombined clay or silicious materials (the puzzolan) represented by the insolubles (presumably the 0.75 percent of unidentified material), plus some of the partly combined or reactive alumina and ferric oxide. There is no figure given in the analysis for "insolubles."

•

LANCASTER STONE CO., Lancaster, Ohio, has been organized by John Smith, and Lafe and Volney Taylor. The company will produce stone veneer for new homes.

Liquid-Oxygen Explosives

A REPORT, "Safety and Performance Characteristics of Liquid-Oxygen Explosives," has been released by the Bureau of Mines for sale through the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Most accidents caused by Liquid-oxygen explosives, used chiefly in open-pit mining, are blamed on the failure to provide and abide by safety regulations for handling this type of explosive, the report states. It describes the results of a cooperative survey made by the Bureau of Mines and the Linde Air Products Co., New York, N. Y., designed to establish test methods and investigate performance characteristics of liquid-oxygen explosives.

Fire danger is the main hazard associated with the use of liquid-oxygen explosives or "LOX," as compared to fixed explosives. Sensitivity to detonation by direct mechanical impact was somewhat higher than that of some fixed explosives, but the sensitivity to frictional impact was considerably lower, research showed. Liquid-oxygen explosives also were tested for burning behavior, detonator initiation sensitivity, sensitivity to electrostatic charges, fire resistance of wrappers, etc.

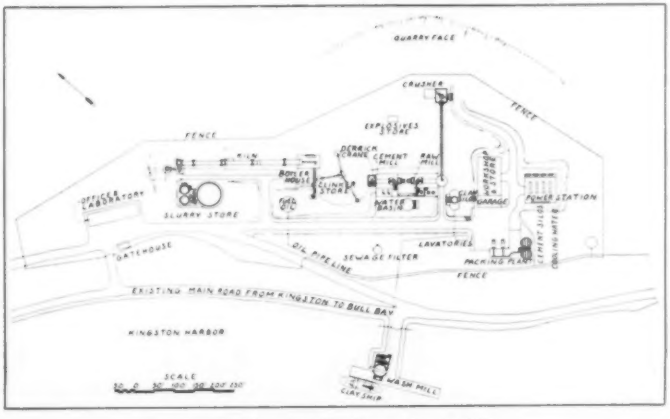
Jamaican Wet-Process Mill

CARIBBEAN CEMENT CO., LTD., a Jamaican firm organized in 1947, is starting construction of an 1800-bbl. per day capacity cement mill, costing in the neighborhood of $4,800,000. The new plant will be located on the outskirts of Kingston, the island's capital.

All major raw materials, i.e., limestone, clay and gypsum, occur in close proximity to each other and adjacent to the plant site. In addition, the fact that fuel oil can be obtained near by and that the plant will be located on a deep-water harbor centrally located in the Caribbean, are favorable factors when considering the economic feasibility and future of the plant.

Principal equipment for the mill will be of F. L. Smidth & Co., manufacture, including a 10- x 300-ft. kiln. The raw and clinker mills will be approximately 8 x 35 ft., weighing 200 tons each and the packing house will incorporate valve-packers for filling paper bags.

The new company is financed by American, British and Jamaican capital, with Edward R. Stettinius appearing on the board of directors.



Layout of Jamaican Wet-Process Cement Mill

QUARRY MOVED DOWNSTAIRS

Achieves LOWER COSTS

When this quarry and primary crushing plant moved down to track level from a rock face worked since 1900, the new operation employed a new layout and equipment of Stephens-Adamson design. Reduced drilling and blasting costs, coupled with efficient handling of as much as 1000 tons of rock an hour and improved storage facilities, have reduced overall costs as planned.

Supplying cost-reducing solutions for difficult bulk materials handling jobs is an old story with S-A engineers. They've been doing it for half a century. From the S-A line that includes *every* type of conveyor, their broad experience enables them to propose the one best type of equipment and conveyor system to hold handling to the lowest possible cost per ton.

Whenever you have a bulk materials handling problem—or would like to know whether you can improve your present methods—let an S-A engineer sit in with you. Write us today—no obligation.

GRANITE ROCK COMPANY
LOGAN, CALIFORNIA

Rock blasted from the quarry is dumped onto an S-A "AMSCO" manganese steel pan feeder. Stone is fed over a bar grizzly, where minus 7" rock passes through onto another pan feeder and then by belt conveyor to screen house No. 1. Oversize rock passes to a jaw crusher. Crushed stone also travels by belt conveyor to screen house No. 1, where rock is classified by size. Some goes direct to car loading bunkers; other sizes to screen house No. 2, where rock is reclassified and sent to a secondary crushing station. The entire conveying system has automatic sequence control from one central location.

STEPHEN S-A ADAMSON MFG. CO.

7 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif. • Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

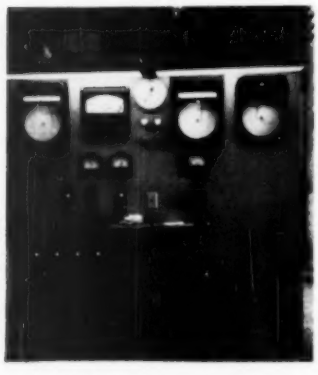
Production

(Continued from page 151)

the cooler. The idea was developed by Lone Star's organization and consists of a swing hammer-type impactor located at the discharge end of the cooler, and its function is to break up large pieces of clinker to pass an inclined stationary grizzly with 1½-in. openings ahead of the breaker. Any piece of material not passing the grizzly is hit by the breaker hammer and thrown back in the cooler to again pass over the grizzly, and the process is repeated until the pieces do pass. This results in clinker delivered from the cooler that almost all passes a 1-in. screen and eliminates the necessity of removing big clinker or pieces of ring material manually.

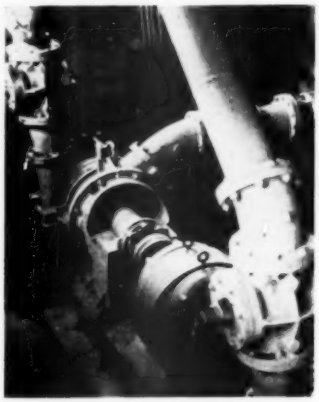
The breakers operate continuously, driven by a 10-hp. motor. The actual power is normally 3.5 hp., which increases to about 5 hp. when clinker is being broken. Clinker from each cooler is conveyed by drag conveyor to an 18-in. skipulter for transfer to a bucket elevator and then into clinker storage silos of 12,000-bbl. capacity.

Total air forced through the clinker bed in the coolers is 28,000 c.f.m. for each of three kilns and 36,000 c.f.m. for No. 4 kiln, as rated at 70 deg. F. and 7 in. s.p. Part of the air is preheated for combustion purposes and the balance is exhausted to waste after passage through the dust collectors. Dust collectors are Western Precipitation Corp. Multiclones, each consisting of a nest of 42 9-in. diameter cyclones for the smaller kilns and 54 for the larger kiln. They are operated under suction from a fan drive by a 40-hp. motor and are very effective in this application in helping to keep the plant clean both inside and outside. This isn't enough volume of dust to justify recovery, as such, but the collectors were installed for their contribution to good housekeeping and improved working conditions. The collectors also keep the clinker drag conveyor under slight vacuum, and the dust is returned back into that conveyor. Pressure drop across the Multiclones is measured as a means of record in order to know the total volume of air by-passed from the cooler. This is directly related to the kiln firing since a definite proportion of the total cooler air volume is by-passed and the balance enters the kiln.



Control panel for new rotary kiln

Shale is handled from quarry in separate trainloads, which dump into crusher hopper as limestone cars are dumped



One of two slurry pumps to deliver slurry from new basin to kiln feed tanks

New Kiln Operation

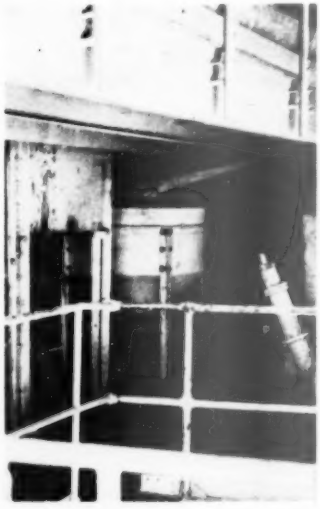
The kilns are fired by natural gas with a nozzle pressure of about 15 p.s.i. and a flame velocity of 7000-8000 f.p.m. Cast iron burner pipes of 3-in. diameter are used and they hold up well under this service. Kiln No. 4 is being fired with 10-15 percent excess air at present, due to an excess volume of secondary air available from the cooler. There are no seal rings on the kiln hoods. Fuel consumption for each of the kilns is in the 1.3-1.4 million B.t.u. per bbl. range.

Lone Star aims at maintenance of constant kiln speeds in all its plants where there are long rotary kilns, and the measurement of kiln speeds and back end temperatures are considered the most important checks to be accomplished by instruments. Each kiln has a thermocouple for measurement of exit gas temperatures, and louvre damper controlled from the burner's floor.

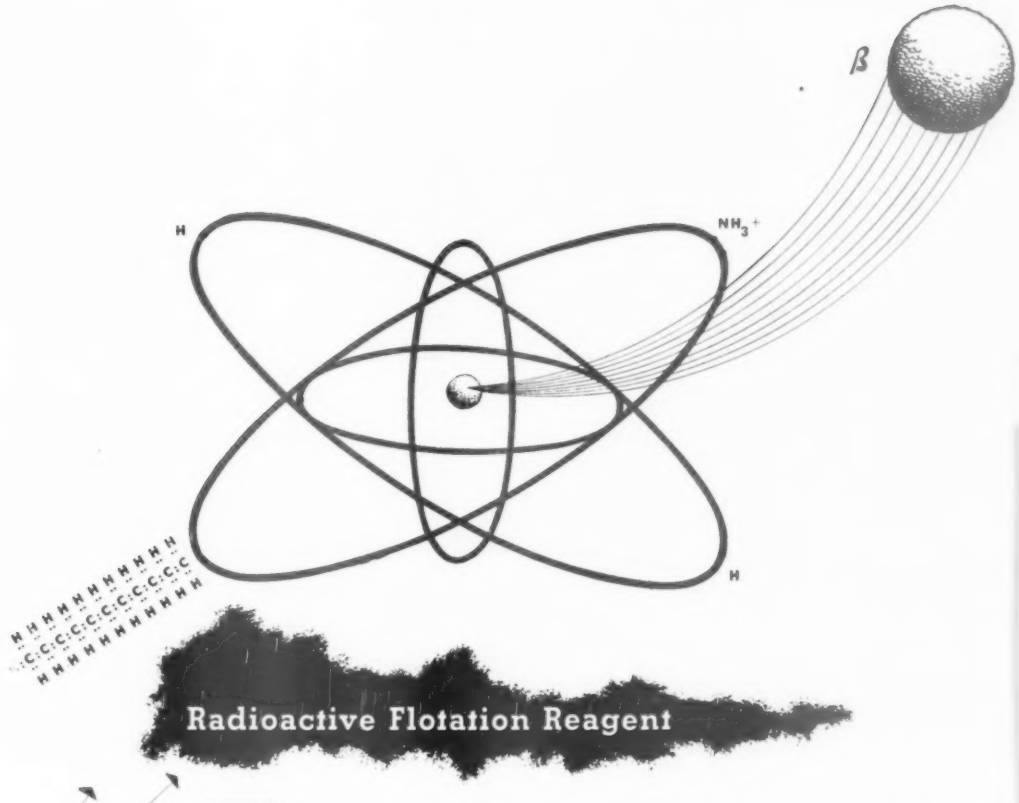
Instruments on the centralized control panel for kiln No. 4 (some are on the other panels) include a kiln gas recording flow meter, hood draft gauge, kiln exit gas temperature recorder, kiln speed recorder, kiln motor ammeter, kiln revolution counter, exhaust fan ammeter, damper position indicator, slurry feeder blinker, alarm horn (on exit gas temperatures) and a clock. Hood draft is maintained at 0.1-0.3 in. of water (negative pressure). Slurry pots are used in connection with each kiln as a check on the rate of feed of slurry from the ferris wheel feeders, in conjunction with the revolution counter on the feeder. Measured amounts are checked with revolutions of the feeder at two week intervals or whenever changes in operation have been made.

Very little difficulty is experienced with either slurry rings or clinker rings in any of the kilns. Maintenance of uniform burning conditions

(Continued on page 188)



Immediately below feeder floor are slurry pots in which periodic samples are drawn as check on kiln production and rate of slurry feed



Radioactive Flotation Reagent

Froth Flotation—the mining industry's most versatile method of concentrating both metallic and non-metallic minerals—long has been the subject of intensive Armour Chemical Division Research.

Today, this research is centered on the use of radioactive flotation reagents—which reveal the composition of the mineral-organic film mechanism with amazing accuracy.

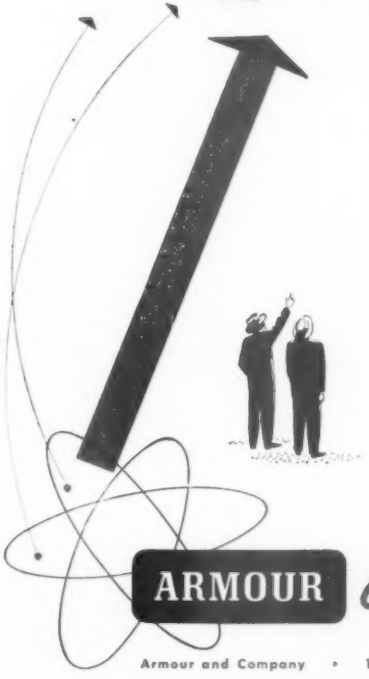
After synthesizing the radioactive flotation reagents—n-dodecyl amine and lauric acid—containing radioactive carbon 14, utilization of these new tools was entrusted to Massachusetts Institute of Technology with a grant from the Chemical Division of Armour and Company.

Unlike metallurgical chemicals in the early days of non-metallic mineral concentration, Armour's Armeens, Armacs, Arquads, and Neo-Fats are made to order for flotation use. The mineral-dressing engineer knows the formula, composition and constants, molecular weight, melting point, percent purity, etc. of Armour flotation chemicals. Only with complete knowledge can he get the most out of your research dollar.

The Armour Chemical Division asks only the opportunity of helping you to use our present extensive range of cationic and anionic flotation reagents, and to offer our basic knowledge in chemical research to help you find the reagent you need.

For the present, we propose to offer you the answers to these questions: Where does the flotation reagent go? How much is used effectively? How much is in the tailings water? What influences the reagent to shift from one mineral to another?

For the future, we offer you the benefits of our continuing research.



ARMOUR *Chemical Division*

Armour and Company • 1355 West 31st Street • Chicago 9, Illinois

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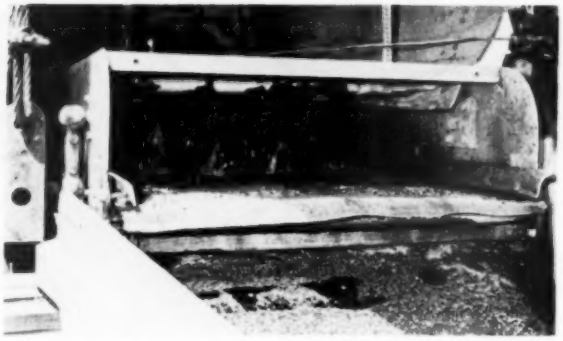
Seco Vibrating Screens"

F. T. Bibb, Plant Mgr.
Batavia Washed Sand & Gravel Co.,
Batavia, N. Y.



"Since installing this Seco vibrating screen, we have had no trouble at all maintaining strict requirements for clean, properly-sized sand and gravel for any job. Our production is mainly sand, but we are taking out about 660 tons of gravel per 8-hour day."

"We have 3 Seco's in operation, screening our entire output. Their smooth operation and trouble-free performance are paying off in more efficient production for us."

Let Seco screening experts recommend the right "performance proven" Seco Vibrating Screen for your job! Send for new Catalog No. 203. Dept. M.

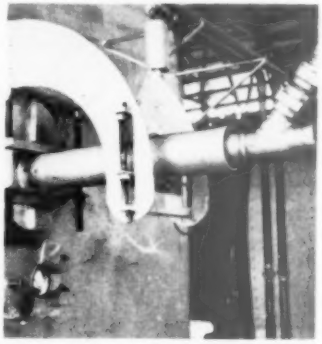
SECO VIBRATING SCREENS

SCREEN EQUIPMENT CO., INC.
1752 WALDEN AVE. BUFFALO 21, NEW YORK
In Canada, United Steel Corp. Ltd., Toronto, Ont.

and uniformity of raw materials and their rate of feed are the main reasons for the practical absence of rings that require removal, and the enlarged diameter burning zones apparently are effective in causing clinker rings to become dislodged.

Finish Grinding

Clinker is ground into cement by three 7- x 39-ft. Unidan mills and two 7- x 24-ft. tube mills in closed-circuit



Close-up of hood of kiln No. 4 showing adjustable gas burner support

with mechanical air separators. Finished cement is pumped into a stockhouse of 311,000 bbl. capacity in concrete silos.

Plant Personnel

V. J. Van Reekum is superintendent of the plant, O. L. Hailey is chief chemist, and F. T. Westenholz is assistant superintendent.

New Mexico Potash Mine

MINING METHODS and practices in a large potash mine in the Carlsbad mining district of southeastern New Mexico are described in a new publication recently released by the Bureau of Mines. (Information Circular 7511.) The potash mine described in this report is in Eddy County, N. M., about 26 miles east of Carlsbad, and is the operation of Potash Division, International Minerals & Chemical Corp., Chicago, Ill.

Sinking of the first shaft in 1936, development of extensive underground mining, completion of a refinery in 1940 to yield an average daily production of 5400 ton of potash, is described in the report. Also mentioned are methods of exploration and sampling, adoption of coal-mining methods and machinery, application of drilling, blasting and undercutting techniques, methods of loading, haulage and ventilation, together with operation of an effective safety program and mine organization.

New Mexico, California and Utah are the largest potash-producing states in the nation. The report also presents a description of the geological formation of this district, together with maps and photographs.

Basing Points

(Continued from page 154)

ca has become great and vouch-safed its citizens that highest standards of living in the world.

The author doubts a more *vital* or imminently important economic issue affecting the future of American commerce, business and industry has ever faced the Congress for constructive, clarifying legislation.

No one can be more opposed to "monopoly" than the author. It has no sound place in American industrial or business life, save and except, perhaps in certain of the service industries which are government regulated, but the Federal Trade Commission's cease and desist order and the Supreme Court's decision in The Cement Case have created the very monopolies they sought to prevent.

Cement Firms Accused by FTC

THE FEDERAL TRADE COMMISSION charged two cement companies with violating the anti-trust laws by giving customers who take delivery by rail lower rates than those who take delivery by truck. The two companies named were the Monolith Portland Cement Co. and the Ideal Cement Co. The officers of both firms and of Monolith's wholly-owned subsidiary, Monolith Portland Midwest Co., were also named as defendants.

The F.T.C. complaint charges that the two firms sell cement to customers who transport by rail freight at a price 20c a bbl. lower than that charged customers who have it transported by truck. This policy, the F.T.C. says, discriminates against the customers who take delivery by truck and so violates the Robinson-Patman Act prohibition against illegal price discrimination.

The new proceedings, F.T.C. officials said, is distinct from the earlier F.T.C. case against the entire cement industry, but there is some connection. In the earlier case, the F.T.C. charged the cement firms with conspiring to fix prices by use of a multiple basing point, delivered price system. One point in the F.T.C. cease-and-desist order, subsequently upheld by the Supreme Court, told the companies to make delivery available by truck or water as well as by rail. It is known that the F.T.C. has been checking on the way the cement firms are complying with this portion of the order. Both firms named in the recent complaint were named in the cement industry case—Monolith under its own name and Ideal through a subsidiary, then called the Colorado Portland Cement Co.

The current complaint says that the pricing policies alleged to be illegal have been in effect since January 1, 1947. The complaint declares that customers of the two firms purchased cement either for resale or for use in the manufacture and sales of ready-

You Don't Need a Microscope to see

Special Alloy Moly-Cop Ball

Regular Carbon Steel Ball

The Difference in Structure and Hardness

TRADEMARK REG.

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Grinding Balls

With the naked eye you can see the much finer martinsitic structure of the Sheffield Moly-Cop ball and its uniform hardness to the core. When compared to fractured carbon balls, the difference is remarkable.

In mills, this important difference shows up in longer wear, retention of shape and minimum spawling. Sheffield Moly-Cop balls grind more tons of ore more efficiently.

Mills around the world have proven, to their own satisfaction, that Moly-Cop's superiority adds up to substantial cuts in grinding costs.

Carbon and Alloy Steel, Ingots, Blooms, Billets, Plates, Sheets, Merchant Bars, Steel Joists, Structural Shapes, Road Guard, Reinforcing Bars

Welded Wire Mesh, Wire Products, Wire Rods, Fence, Spring Wire, Nails, Rivets, Grinding Media, Forgings, Track Spikes, Bolt and Nut Products

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"Cement Clinker Grindin'??

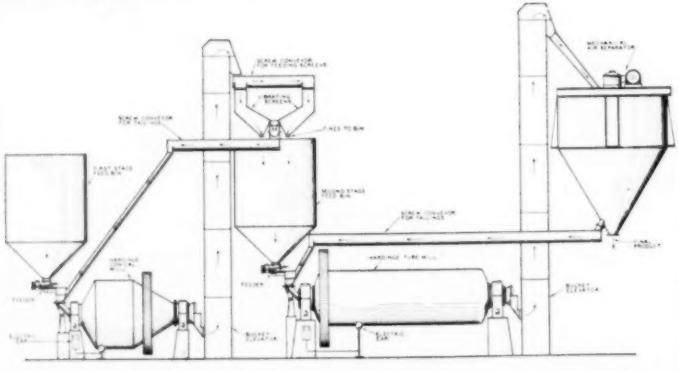
...easy!"

"Shure, whin ye use a Hardinge grindin' hook-up like I got here, there's nothin' to it.

"I put me raw clinker through a 10'x48" Hardinge Conical Ball Mill. The discharge cones shoves me fines through as fast as they're made. Vibratin' screens return me oversize to the mill. That gits me down to minus 20 mesh.

"Thin I put me stuff through a Hardinge 8'x26' Ball Tube Mill in closed circuit with a air separator which takes me down as fine as I want. I kin push through 125 barrels of cement an hour easy as pie!

"If ye need some dope on cement grindin', jist write Hardinge. Ask 'em fer Bulletin AH-377-7."



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mixed concrete, concrete building block and other concrete products.

These customers compete with each other and with other firms buying from other producers, the F.T.C. says, and the effect of the price discrimination may be "to injure, to destroy or prevent competition with customers receiving the benefits."

Ideal's cement plants are at Portland and Boettcher, Colo. The Monolith plant is at Laramie, Wyo.

The foregoing information was taken from the *Wall Street Journal*.

Employment in Portland Cement Industry

A BREAK DOWN of the statistical record of employment and productivity of labor in the cement industry in the United States in 1945 and 1946 shows that California, Alabama and Texas, in that order, had the highest production per man, per hour and shift. On this basis, California production was, respectively, 3.64 and 29.20 bbl.; in Alabama, 3.27 and 26.27 bbl.; and in Texas, 3.04 and 24.90 bbl. Total output from these three States, employing 17 percent of the total men employed by the cement industry in the United States, and working an average of 322 days, reached 38,150,485 bbl., or 24 percent of the total output of the cement industry in 1946.

In 1946, mills in California, Alabama and Tennessee, in that order, had the highest production per man, per hour and shift. Average production, in bbl. of cement, by mill employees, per man, per hour and shift in California was, respectively, 4.87 and 39.05 bbl.; in Alabama, 4.71 and 37.80 bbl.; and in Tennessee, 4.21 and 33.12 bbl.

Quarry and Crusher Employees

Quarry and crusher employees in Texas, Michigan and California, in that order, in 1946, handled the largest quantity of rock per man, per hour and shift. Average quantity of rock moved on this basis in Texas was 7.56 and 61.65 short tons; in Michigan, 7.16 and 58.76 tons; and in California, 6.29 and 50.81 tons. Total rock moved in cement quarries in these States, who employed 15 percent of the total quarry and crusher men employed by the cement industry, and working an average of 288 days, reached 9,857,679 short tons, or 22 percent of the total quantity of rock handled in cement quarries in the United States in 1946.

The foregoing statistics have been abstracted from Mineral Market Report, Mms. No. 1738, Mineral Industry Surveys, United States Department of the Interior, Bureau of Mines. The report was prepared by G. R. Gwinn and E. V. Balser, under the supervision of G. W. Josephson, Chief, Nonmetal Economics Branch, Economics and Statistics Division.

Excavation

(Continued from page 109)

material here is 100 percent gravel and sand.

Returning to the scalper, the alternative routing of material is to the 350 ft. long, 24-in. inclined belt that also receives the crusher products. Gravel and crushed rock are discharged over a three-deck, dry 4- x 10-ft. final sizing screen. The belt rides on Pioneer carrier and return rolls.

The final three-deck screen has 2-, 1½-, and 3/16-in. mesh, respectively. Sized rock falls to wooden bins below that have a total capacity of 160 cu. yds. Oversize from the top deck can go to bins or may be chuted to a set of 22- x 40-in. Pioneer rolls. The rolls discharge to an inclined belt conveyor, 80-ft. centers, that returns the material to the principal belt serving the main plant. Rolls are driven by another 50-hp. single cylinder, vertical, Fairbanks, Morse diesel engine. Material can be delivered by truck or rail.

Offices of the Jones-Scott Co. are at Walla Walla, Wash. Louis Pifer is manager; Ervin Chapman is superintendent; and L. R. McCracken, plant foreman. Jones-Scott Co. also operates a gravel plant in Walla Walla, Wash.

Labor Relations

(Continued from page 91)

police power. The union, as usual, contended the law violated the U. S. Constitutional right of free speech and assembly.

Appeal was made to the U. S. Supreme Court, which remanded the case back to the Arkansas Court without proceeding to the question of the constitutionality of the law, because of some inconsistencies in the records of the lower courts. These have now been cleared up by the Supreme Court of Arkansas, which reaffirmed its previous decision that the law is constitutional. The Arkansas law is modeled after the Texas law on the same subject, and the Texas law has received an OK from that State's Supreme Court. The Arkansas case involved the death of a negro worker by violence from union pickets.

The Supreme Court of the United States will now pass on the constitutionality of the act, on appeal by the union's attorneys.

High Cement Production Reported in Mexico

A RECENT MEXICAN DECREE exempting cement exports from payment of duties has increased consumption of Mexican-manufactured cement by both Central America and United States. An additional factor has been the increased public works activity on the part of the government. Last year, 1948, practically all plants were operating at capacity, although productive capacity is now about double what it was before the war.

CHOOSE "QUICK-WAYS" REG. U. S. PAT. OFF. FOR SURE PROFITS!

YOU CAN BUY A "QUICK-WAY" TRUCK CRANE for as low as $6,775.00 complete with chassis F.O.B. Factory Write for full details

Every "QUICK-WAY" part will deliver its capacity rating and more, and you get more utility out of a "QUICK-WAY" fully equipped, than any comparable equipment. Each "QUICK-WAY" is easily converted in minutes from shovel to crane, dragline, clamshell, pile driver, scoop, trench-hoe or backfiller. Buy just the attachments you want to do more jobs better.

The essentials built into every "QUICK-WAY" mean sure profits on a small investment; economical to buy, economical to use, it's one of the most useful machines you can own. There's a "QUICK-WAY" owner near you; ask HIM. Your nearby "QUICK-WAY" distributor has a pleasant surprise for you when you ask him for prices.

Capacity in a truck shovel is fundamental . . . but it isn't enough. Check your requirements against all the advantages "QUICK-WAY" offers:

1 Convertible Units
2 Mobility and Speed
3 All-Steel Construction
4 Low Center of Gravity
5 Accurate Balance
6 No Extra Counterbalances
7 High Capacity-to-Weight Ratio
8 Interchangeable Parts
9 Simply and Ruggedly Built
10 Economical Operation
11 Low First Cost
12 Low Maintenance and Repair
13 Extra Profits

MODEL E: 4/10 cu. yd. capacity, mounts on any standard 5-ton truck.
MODEL J: 1 4 cu. yd. capacity, mounts on any standard 1½-ton truck.

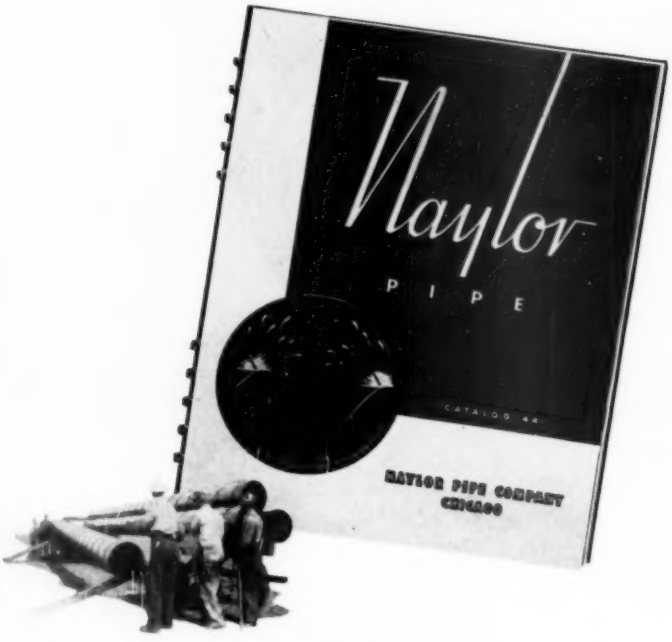
"QUICK-WAY" TRUCK SHOVEL COMPANY
DENVER, COLORADO
Worldwide Distributor Sales and Service

PIONEER IN POWER SHOVELS FOR TRUCK MOUNTING AND STILL THE LEADER

FACTS ON

LIGHT-WEIGHT PIPE

FOR MINING SERVICE



This Helpful Book Gives Full Data on Applications and Performance Advantages of **NAYLOR PIPE**

If you have not already received a copy of this fully-illustrated guide for pipe users, write for it today.

Find out how Naylor light-weight pipe can serve you better on ventilating lines, high and low pressure water lines, air lines, hydraulicking, dewatering, drainage, suction lines, tailings lines.

Naylor Pipe

NAYLOR PIPE COMPANY

1237 East 92nd Street, Chicago 19, Illinois

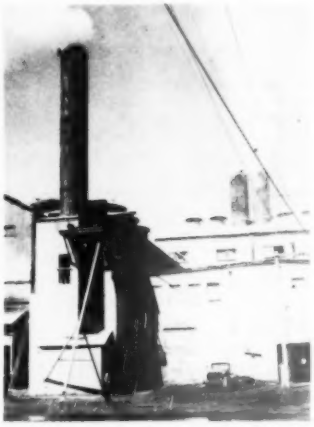
New York Office: 350 Madison Avenue, New York 17, N. Y.

Flexibility

(Continued from page 141)

x 140-ft. kilns already in service and the replacement of a bucket-type clinker carrier with a drag chain serving all four kilns completed the major equipment installations. This new kiln has been equipped with a Vanderwerp recuperator as are the other three kilns. It is fired with a No. 453 Raymond coal mill while the older kilns were equipped with Babcock and Wilcox, size 138, type B, mills several years ago.

Production from this kiln has exceeded estimates somewhat, producing around 1300 bbl. per day, as compared to an output of 825 bbl. per day for the shorter kilns. The extra length on this kiln is showing up very well as to increased production and fuel economy although accurate figures on fuel consumption are not yet available.



Feed end and stack for 9- x 8- x 250-ft. kiln. Elevator is used to reclaim flue dust and provision is made to waste dust when making low-alkali cements

Incidentally, it has been found that the kiln differential (ash absorption by the mix) is about 1 percent higher for this kiln than for the shorter kilns. That is, the same mix fed to all four kilns results in a clinker having around 1 percent lower CaO from the long kiln. This is no doubt caused by the extra length, although the difference in flame characteristics from the two different types of coal may have some effect also.

At the present time the improvements have all been completed with the exception of the installation of a 7-in. Fuller-Kinyon pump with a C-200 compressor to be used as standby cement conveying equipment from mills to silos, and some bulk cement loading changes now under construction. The additional F-K system will permit still further flexibility of the grinding department in that it will al-

low two different types of cement to be in production at the same time. The change in bulk loading was necessitated by the change in trackage resulting from the fourth kiln installation. A new bulk loading track is now being built with a new track scale at

New 9-in. blast-hole drill used for drilling in high lime quarry

the loading station. A new truck scale was installed in 1948 and bulk trucks will now be loaded here also when the F-K line from the silos is complete.

Other new equipment purchased to take care of increased quarry production has been three new White gasoline motor trucks to supplement a fleet of Studebaker trucks already in service, a new 9-in. Bucyrus-Erie 29-T blast hole drill and a 1½-cu. yd. diesel-powered Marion shovel. With this expansion program now completed and in production, the Trident plant is now producing at the rate of 3600 bbl. per day, which is keeping up very nicely with demand.

Permalite Demonstration

GREAT LAKES CARBON CORP., Newark, N. J., recently held a demonstration of Permalite, a lightweight plaster aggregate. Over 100 architects, structural engineers, plastering contractors and building officials were present. The company will make Permalite available in the East for the first time, it is said, upon completion of a new $500,000 plant at Linden, N. J., this summer.

Reopen Quarries

MORTIMER R. PROCTOR, vice president, Vermont Marble Co., Proctor, Vt., has announced plans to reopen and operate stone quarries at Marble, Colo., as soon as conditions such as cost of new machinery, cost of transportation, etc., are advantageous.

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Baughman HI-SPEED

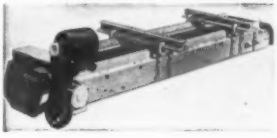
Conveying Equipment

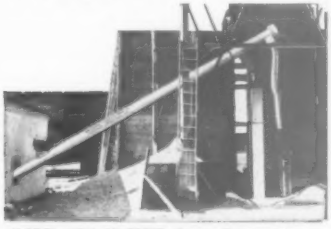
This Ready-Mix Plant gets peak capacity with Baughman HI-SPEED Bulk Materials Handling Equipment. Three Baughman units — the HI-SPEED Belt and Bucket Elevator for the elevation of sand and gravel to hoppers . . . the Auger Type Conveyor carrying cement from the building to the truck under the hopper . . . the Heavy-Duty Undertrack Unloader charging the Belt and Bucket Elevator . . . All work as a team to make a very smooth, quiet and economical operation with HI-SPEED performance. Baughman standardized production methods cut your equipment costs. Quality materials and expert construction minimize your maintenance expenses.

Write for Information About Our Special, Built-to-Order Conveying Equipment . . . There is No Obligation.

MODEL 175 Belt and Bucket Elevator with Centrifugal Discharge Head.

MODEL 190 Heavy-Duty Troughed Belt Unloader





MODEL "Q" HI-SPEED Screw Conveyor

BAUGHMAN

manufactured by

BAUGHMAN MANUFACTURING CO., Inc.

989 ARCH STREET, JERSEYVILLE, ILLINOIS

FOR HARD FACING AND REPAIR

Amsco WELDING PRODUCTS

Amsco NICKEL-MANGANESE

• Amsco Nickel-Manganese filler bars and electrodes built up this dipper used in the rugged service of a northern iron ore mine. For buildup and repair work on manganese steel, Amsco Nickel-Manganese will provide a long wearing surface to resist heavy impact and abrasion. Nickel-Manganese electrodes are cold drawn rods, provided either coated for D.C. and A.C. or bare for D.C. welding. Weld deposits surface harden to 450-550 Brinell under cold working and have a toughness and ductility which approaches that of standard 13% manganese steel. Drilling sheaves, spindles, crossings, wobblers, crushers, and hammer mills are other applications where Nickel-Manganese has proved its value. Amsco cast and rolled repointer bars, plates, and hardfacing rods are also available. Write for Bulletin 10-A and W-1 for sizes and types of bars.

Ask for new booklet:
"The Metallurgical Background for Welding Manganese Steel"

Brake Shoe
AMERICAN MANGANESE STEEL DIVISION

377 E. 14th St., Chicago Heights, Illinois
Offices in Principal Cities

One of the diesel engine, air compressor units in use at the quarry

Quarrying

(Continued from page 104)

hammers. Two X-71 Ingersoll-Rand wagon drills also are available. To supply air the company has a 220 c.f.m. Chicago Pneumatic portable unit and three 700 c.f.m. stationary Ingersoll-Rand compressors, all of which are driven by D-1300 Caterpillar diesels.

For loading in the pit the company has two diesel-powered shovels, both 2½-cu. yd. units. One is a Link Belt Speeder and the other a Bucyrus Erie. Primary shots are drilled with 14-ft. burden and 16-ft. spacing. The last two shots were made using a Du Pont delay machine.

Crushing and Screening Plant

Dump trucks, on arriving at the crusher, dump to a 48-in., Telsmith apron feeder that serves a 42- x 48-in., Traylor Bulldog crusher. The discharge of this unit is received by a 48-in. belt conveyor and is delivered to a 4-x 8-ft., single-deck, dry, Niagara scalper with the oversize passing to a 24-in. x 36-in., Farrel-Bacon jaw crusher. The crushed material and the throughs from the scalper go to the dry plant on an inclined 36-in. belt conveyor. Located at the top of this plant are two Robins Gyrex double-deck screens. One is a 5- x 12-ft. unit and the other is 6 x 10 ft. For final crushing two Symons cone crushers are used. One is a 4¼-ft. standard crusher and the other is a 4-ft. short head type.

Vibrating feeder under the surge pile in the plant flow

A 24-in. belt conveyor that transfers rock to the surge pile was installed in two sections. At the end of the first section a transfer station is located so that crushed rock from the 4¼-ft. cone crusher can go to the surge pile via the second section of the belt conveyor, or, can by-pass to a 24-in. cross belt and be returned to the belt conveyor serving the dry screens and be re-screened.

In the wet plant under construction, two 4- x 12-ft., triple-deck Riplflo, Allis-Chalmers screens and two 4- x 12-ft. double-deck Nordberg screens are being installed. These are being mounted above a cylindrical, corrugated steel tank from which trucks can be loaded direct, or where cars can be loaded by means of a loading belt. Trucks can also be loaded at the dry plant. Stone from the surge pile is reclaimed by a Syntron electric vibrating feeder that can handle 200 t.p.h.

A. D. Hagwood, superintendent

The screening plant is laid out to eventually supply all sizes of rock and when fully constructed will have a total of 11 belt conveyors including two loading belts. Boston Woven Hose and Rubber Co. and Quaker Rubber Corp. belts are used. The long inclined belt that delivers stone from the dry plant to the wet plant and the wet loading belt are both 30-in. units. All other belts in the plant, unless otherwise mentioned, are 24 in. in width. The plant is located on the Southern Railroad and has a capacity of 250 to 300 t.p.h.

Masonry Cement

(Continued from page 156)

delivery to two 3-tube Bates packers. Electrical controls throughout the plant were supplied by Westinghouse and an added feature is a light control panel located at a convenient point on the operating floor so that the operator can see at a glance the electrical operating conditions.

To insure a high quality product, two automatic samplers are provided. One samples the discharges of the Raymond mill and the other the tube mill discharge. Both were made in the company's shop and consist of a $1\frac{1}{2}$-in. dia. wood auger that is geared

Light indicator panel showing electrical conditions throughout plant

down to turn very slowly. This unit is in the flow of material and delivers a small but steady fractional part of the whole stream to suitable sample cans which, when filled, are sent to the laboratory for analysis.

Plant Construction

The entire plant is of steel construction and is a neat and well planned installation. There are a total of three Sly dust collecting units in the plant: one on the packers, one on the Raymond mill vent, and one for general utility purposes. The dust collectors discharge to steel bins and the product is returned to the system. Rotary valves are provided at all bin discharge points. All the equipment and pipe lines in the plant are painted distinctive colors for easy identification: air lines are painted green; dust collectors and related piping, orange; Raymond mills silver; fuel oil pipes are red; and electrical conduits are black. The plant has a capacity of 70 to 75 bbl. of masonry cement per hr. Johan Norvig is chief engineer.

•

LEHIGH PORTLAND CEMENT CO. has filed plans with the city to enlarge its building in Buffalo, N. Y., at a cost of $7500.

.. An Eagle Washer Exceeds it's Rated Capacity by 20 Tons per Hour at the Eagle Sand & Gravel Co.

This Eagle Washer-Classifier-Dehydrator has given satisfactory and efficient performance day after day for over two years at the Eagle Sand and Gravel Co. plant near Sioux Falls, South Dakota. Handling at times up to 20 tons per hour over its rated capacity, the Eagle has given continuous performance with only a few minor maintenance repairs.

Designed by co-owners William G. and Robert F. Bruns—who also supervised construction—this complete washing and screening plant processes several grades of concrete material for general sale. A dredge moves the raw material to a screening tower located over eight aggregate bins designed for gravity loading of trucks. Two screens are used for grading—the fine material from the lower screen feeds to the Eagle for complete washing and dewatering. The washed material is fed to a manually controlled two-way chute feeding two bins. When one is filled the material is chuted to the other to allow continuous operation.

The Eagle Washer attacks the cleansing problem two ways to assure positive results: (1) the tumbling, squeezing action of the conveyor screw rubs grain against grain to loosen all foreign material; (2) a rising column of water the length of tub floats out all undesirable material. The Long Weir with adjustable lips, coupled with volume of water feed, provides exact wash water control for retention of fines to any classification. Send for Catalog 47.

SINCE 1872 Progress...Service

Sand and Gravel Equipment

"SWINTEK" DREDGE LADDERS — SCREW WASHERS
LOG WASHERS — DEHYDRATORS — SAND TANKS
CLASSIFIERS — REVOLVING SCREENS

EAGLE IRON WORKS

1137 Holcomb Ave. • Des Moines, Iowa

"Cape Ann"
Forged
Steel Drop Ball

Investigate the use of a "Cape Ann" FORGED STEEL Drop Ball for secondary breakage! Our New Design permits cable to be attached thru rugged forged link rising from neck of drop ball minimizing cable wear.

2000 to 8000 lbs.

Deliveries Prompt

For further information write—

Cape Ann Anchor & Forge Co.
Post Office Box 360
Gloucester, Mass.

Fuel Conservation

(Continued from page 164)

conditions, such as chemical composition and physical condition of raw materials, indicating process to use and fineness required, also type of fuel and quality of the same.

"The largest kiln so far on record and operating in the U.S.A. is 12 ft. dia. by 465 to 475 ft. long, using the wet process, with an output of 4000 bbl. per day at 60 seconds per revolution and using 1,000,000 B.t.u. per bbl. fired into the burning zone.

"It is understood that even larger kilns are now being designed and that great improvements have been made in the design of the shell, the brick lining, the electric driving control and the feeding apparatus, any of which details, failing to constantly operate satisfactorily, will, in turn, seriously interfere with the kiln performance —especially the larger units—they being super-sensitive to even the smallest variation in speed, feed and temperature. While instrumentation seems proper—at least interesting to the trained engineer—many instruments purchased and installed with the best of intentions (based on what the book said and what may be expounded on paper) are hanging around in kiln rooms all over the world, unused and gathering dust for some very good reasons:

"1. Instruments require constant and expert maintenance, seldom available at the plant.

"2. Operating conditions must be understood by designers of the installation, taking fully into consideration the constant fouling of any sensitive electric, magnetic or light element which, for the purpose, must be exposed to the extreme elements constantly roaring within the kiln, consisting of steam, dust, corrosive gases—all at high temperatures, constantly varying in velocity and pressure, to maintain the natural balance.

"3. Conversely, the operator, in order to maintain expected benefits, must be of exceptional intelligence, to properly make all the necessary deductions from the constant misreadings on the instruments compared with actual conditions in the various kiln zones of interest, these facts being the great obstacles thus far to the complete mechanization or automatic control of a rotary kiln.

"4. It would seem from experience that instrumentation for kiln control should be simple, and that the expected operating result should be set for the operator, with little freedom for action or adjustment on his part; and it would be preferable to have special portable instruments, used by a trained technician from time to time, for checking results and formulating any desired change in instructions to the operator.

"Making a fair and practical comparison between kilns of different sizes and operating under identical conditions, we submit the following data:

"Wet Process Plant.

Kiln 8 x 9 x 220 ft. long—1100 bbl. per day; slurry 46 percent moisture; using 1,550,000 B.t.u., natural gas and operating at 65 r.p.h.

Kiln 10 ft. x 11 ft., 3 in. x 374 ft. long—2100 bbls. per day; Slurry 46 percent moisture; using 1,350,-000 B.t.u. natural gas, and operating at 50 r.p.h.

"Dry Process Plant.

Kiln 9 x 8 x 100 ft. long—700 bbl. per day; using 1,500,000 B.t.u., coal, and operating at 30-40 r.p.h.

Kiln 11 ft., 3 in. x 175 ft. long—1800 bbl. per day; using 1,070,000 B.t.u., coal, and operating at 30-52 r.p.h."

A Western manufacturer, with several plants wrote:

"In regard to fuel conservation, our company has recently built two new cement plants, each having two kilns 400 ft. long. Our records are not yet conclusive as to what economies might be ultimately effected. It is quite obvious, however, that other complications develop in the operation of long kilns that may offset economies, and perhaps in another year our experience will be of long enough duration to develop some conclusions that would be of value in your publication. Such is not the case at this time, however."

A manufacturer from the Lehigh Valley commented:

"We are not prepared to give figures on kiln efficiency. This is chiefly because our operation for the past two years has concentrated more upon high cement tonnage than on savings on cost of coal. In 1948 our fuel cost was high because we had to use many tons of low-grade coal. This year the quality of coal so far is excellent, but we look forward again to the possibility of a prolonged coal strike. Therefore, our present figures would not be conclusive in comparison with previous performance.

"Your second question regarding fuel conservation is a live one. With coal costing in excess of $8 per ton delivered, we must do everything we can to lower the fuel requirement per bbl. If we were to build new plants we would probably go to extremely long kilns and purchase power. I can assure you, however, that if we develop maximum efficiency from our present equipment, the heavy cost of new and more efficient kilns becomes hard to justify. Our old kilns, which are attached to waste heat boilers, are operating on an apparent heat requirement of slightly more than 1.2 million B.t.u. per bbl. True, if we threw them away and bought new kilns we would probably burn on something like 850,000 B.t.u. per bbl. and purchase 50 percent or more of power. The justification for an investment of nearly $2 million would be something like an 8 percent return on the investment before depreciation.

Would you want to borrow $2 million under present day conditions in order to earn a return of say 2 percent after depreciation? I doubt it.

"Therein lies one answer to the trend towards long kilns in inefficient plants. I will admit that if our kilns were extremely short and were burning over 100 lb. of coal without waste heat boilers, we would probably tear them out and purchase new equipment because if we did not we would soon go broke.

"I cannot, unfortunately, provide you with the information you desire in connection with B.t.u. consumption per bbl. of clinker today compared with that of ten years ago. In the last decade we have isntalled Fuller coolers and unit coal pulverizers. We have made a radical change in our burning standards and in the amount of electrical energy generated per lb. of coal. I think we are getting better combustion today than we had ten years ago. If you are looking for merely an overall figure and that an approximate one, it might be said that we were using 105 lb. of coal ten years ago against 90 lb. today."

A producer with long dry process kilns said:

"On dry process kilns, 9 x 314 ft., rotating at 85 r.p.h., we expect, under normal operating conditions, to produce clinker at 850,000 B.t.u. per bbl. On kilns fed with filter cake, 11 x 350 ft., operating at 80 r.p.h., we expect, under normal conditions, to produce clinker at 975,000 B.t.u. per bbl."

A California manufacturer commented as follows:

"Our company has had considerable success in improving kiln operations. Our new 360-ft. kiln produces 125 bbl. per hr., compared to 73 bbl. per hr. produced by our 240-ft. kilns in 1939. Our B.t.u. consumption is now 1,200,000 per bbl. as against 1,500,000 in 1939. We have converted from fuel oil to natural gas during the past ten years.

"Higher kiln speeds (75 r.p.h. in 1949 and 64 r.p.h. in 1938) have been extremely beneficial both as to fuel economy and quality of clinker. The technique of burning has improved during the past ten years, due principally to information provided by better instrumentation of the kiln."

A Midwestern manufacturer who installed slurry filters and modern steam-generating equipment said:

"In one of our plants we have installed several improvements as follows:

"Installation of filters which resulted in increased capacity of about 15 percent. Along with this increase, we realize approximately 25 percent increase in steam production from our waste heat boilers, notwithstanding the fact that our B.t.u. consumption per bbl. was lowered approximately 13 percent. Coincidently, with installation of filters, we increased speed of our kilns 50 percent which we feel

A DEISTER RECORD

243,000 Tons Without a Cloth Change

243,000 tons of material sized without a screen cloth change . . . that's the record of a 5′ x 12′ triple-deck Deister Vibrating Screen that helped increase plant production 400 per cent during its first season of operation.

Installed in 1946 at the Kickapoo Sand and Gravel Company Plant, Peru, Indiana, this Deister Screen has averaged 300 tons per hour . . . 270 tons of virgin feed, plus 30 tons of circulating load. Since its installation, this screen has required no service other than minor maintenance.

The rugged design and construction of Deister Vibrating Screens assure minimum maintenance and high capacity throughout long service life. Proved dependability, faster grading, and more accurate sizing have made Deister tops with operators the world over.

Write for Bulletin 27B — "Better Sizing Cheaper."

DEISTER SCREENS

DEISTER MACHINE CO.

FORT WAYNE 4, INDIANA

SHARPER SIZING
GREATER FLEXIBILITY
HIGHER PRODUCTION
THROUGH *Selectro Control*
OF YOUR FINE SCREENING OPERATIONS

Selectro

VIBRATING SCREENS

SPECIAL FEATURES

- **Selective Throw: 8 vibration adjustments can be made while unit is in operation.**
- **Adjustable Tilt: Quick Control of Flow of Material being screened.**
- **Easy Cloth Change • Quick Opening Top and Ends.**
- **Lubrication: Crank case variety, borrowed from the automobile, assures perfect lubrication and easy oil change.**
- **Stabilizers rigidly control tilt angle at all times.**
- **Rubber mounting controls vibration. All moving parts fully enclosed for safety.**

Selectro Control of your cement scalping or other scalping involving removal of lumps or foreign matter from extremely fine materials is the one means of securing greater capacity at sharper size gradations.

Selectro 8-way vibration adjustment and easily controlled tilt enables your operator to maintain maximum screening efficiency at all times and quickly compensate for variation in material consistency. All adjustments are made while screen is in operation. No special tools required.

Selectro Engineers can answer your fine screening problems. You are not obligated by asking for their recommendations.

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Toronto, Ontario

AFRICA
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CONTINENTAL EUROPE & INDIA
Head Wrightson & Co., Ltd.
Stockton-on-Tees
England

Pulverizers

Have you investigated our new
BRADLEY HERCULES MILL?
Unquestionably the last word in
Economy and Simplicity.
(Send for New Catalog No. 59)

BRADLEY PULVERIZER CO.
ALLENTOWN, PENNA.

perhaps should get some credit for better capacity and fuel saving.

"The new turbines, installed during immediate postwar period, reduced steam required per kilowatt hr. about 30 percent which again reflected a marked saving in fuel consumption.

"Our new coolers, of course, are now giving us added kiln length meaning greater ultimate capacity and they, having improved our clinker grindability, induced positive help in reducing our fuel requirements.

"The B.t.u. per bbl. of cement burned at this plant has been reduced from approximately 1,500,000 to 1,-500,000 and 1,150,000 to 1,200,000 at our other plant, and our kiln speeds have been increased to approximately 60 r.p.h. at both plants.

"We have also changed the raw mills at the latter plant, from a three compartment mill to two with a screen separation of the material in the grinding process. This has improved the quality of the slurry making it easier to burn, and also has increased the capacity of the raw mills."

A New York manufacturer wrote:

"We have no difference in length of kilns so we are not in position to give any figures on it. We have, however, observed a fluctuation in the coal consumption per bbl., influenced largely by the kind of coal available. The frequent disturbances in the mining labor situation have required the obtaining of coal from most any source to build up an inventory. This has been corrected somewhat lately, but at present the situation is quite disturbed again and in the main we find our amount of coal per bbl. increasing. We are studying again the possibilities of the long kiln, but doubt if we will undertake anything of this nature soon."

From the far West came the following comments from a manufacturer with long wet process kilns:

"Regarding your question in relation to the savings in fuel based on using longer kilns and more attention to firing practices, I would like to advise that we experienced a higher fuel ratio than when we first started to produce cement. Minor changes in burning practices have been made; however, higher secondary air temperatures and lower volume with higher velocity primary air have been outweighed in their effect on fuel economy by other changes required due to cement composition, quarry operating conditions and kiln feed solids. The latter changes have been necessary in spite of their adverse effect on fuel economy.

"We have definitely found that higher kiln speeds do give us slightly increased capacity and have a small beneficial effect on fuel economy. The design limits of existing equipment are such that the fuel benefits of this direction of operation cannot be completely explored. We believe that optimum conditions on existing equipment should reflect a fuel consumption

in the order of something less than 1.1 million B.t.u. per bbl."

A manufacturer in Ohio commented:

"Our experience in fuel economy is limited to short kilns (10 x 165 ft.) generating power by waste heat. Over a ten-year period through the year 1947, our B.t.u. consumption per bbl. of clinker remained almost static at about 780,000 B.t.u. per bbl., after an allowance was made for coal fired to the kilns, which was used to generate power.

"In 1948 instruments were installed on our kilns which give us a continuous analysis of flue gases and also clinker temperatures. Since these instruments have been in use, the B.t.u. consumption per bbl. of clinker has been reduced about 3.5 percent and it is our belief that this figure will be further reduced, possibly up to 10 percent as the operators become better educated in the use of instruments for controlling combustion."

From the Midwest, a manufacturer said:

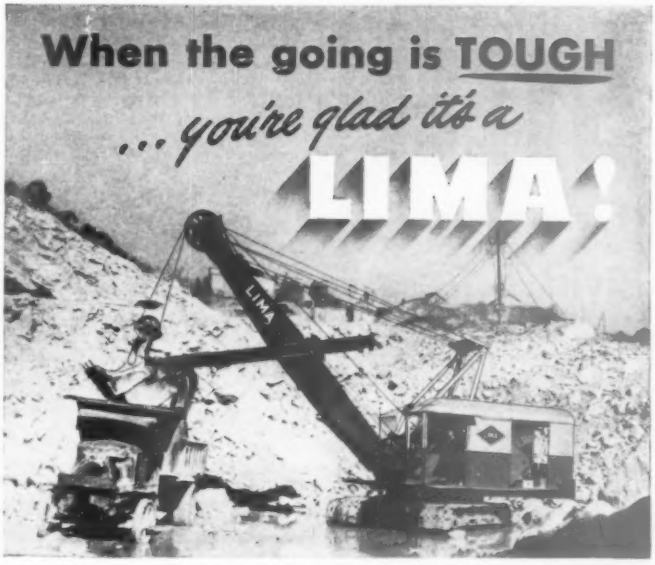
"At one of our plants we are obtaining substantially the same efficiency from our present kilns that we did ten years ago. These kilns are 11 x 175 ft., and are attached to waste heat boilers. They are fed with cake of an average moisture of about 17 percent. Fulton County Illinois coal is used principally, having approximately 10,300 B.t.u. per lb., and about 160 lb. of coal are consumed per bbl. of clinker produced. We are installing an additional kiln which should be in operation by approximately August 15, which will be 11 x 375 ft., which will be fed with material from the thickener having moisture of about 38 percent. That kiln will be operated with the same kind of coal, and we expect that the kiln will produce clinker with approximately 100 lb. of coal per bbl. The new kiln will be operated at a much higher speed than the present kilns, and will have a very complete set of instruments to control draft, oxygen, and CO_2, air, etc.

"At our second plant, no material changes have been made during the past ten years, and consequently the fuel consumption is substantially the same now as it was ten years ago. Those kilns are fired with Oklahoma coal, having approximately 11,500 B.t.u. per lb., and about 120 lb. of coal are consumed per bbl. of clinker produced. The kilns here are all served by a central coal pulverizing plant."

Research

A majority of cement manufacturers who do research independently of industry-wide research through the Portland Cement Association are doing so in application of the association's work which is comprehensive and heavily relied upon. However, a few manufacturers reported independent study. Among the more significant comments were the following:

"I believe the principal trouble is



This LIMA Type 802 Shovel excavating limestone in a South Carolina quarry is a perfect example of the application of correct equipment to a job. This rugged 2 yard machine is a favorite among quarry operators because of its inherent stamina, its maximum output with minimum weight, its ease of operation with air-control of all major motions, its anti-friction bearings, and its simple, quick convertability to crane or dragline.

LIMA Equipment STAYS ON THE JOB!

Down-time of excavators in a quarry invariably means tying up other expensive equipment and manpower. A Lima user recently wrote us: "We used our machine on a double-shift basis for over a year and have had no delay whatsoever other than a negligible delay caused by a loose fan belt." Records like this are the reason why alert quarry operators insist on LIMA equipment.

The Lima line includes Shovels ¾ to 6 yards, Cranes 13 to 110 tons and Draglines variable. Write for description bulletins.

Lima Shovel and Crane Division
LIMA, OHIO
OTHER DIVISIONS: Lima Locomotive Works Division; Niles Tool Works Co.: Newark, Ohio; Bucyrus Co.

LIMA HAMILTON CORPORATION

MANGANESE STEEL CASTINGS

for
PULVERIZERS
CRUSHERS
ROLLS
SCREENS

for
SHOVELS
DREDGES
CRANES
CONVEYORS

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Every Kind

Quick Delivery

Plates, Structurals, Bars, Sheets, Tubes, etc. Carbon, Alloy, Stainless Steels, Babbitt Metal.

RYERSON

Joseph T. Ryerson & Son, Inc. Plants: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco

THIS BOOKLET MIGHT SAVE YOU MANY HOURS OF PRECIOUS WORKING TIME

Tells how to keep rotary kilns running when trouble occurs—either permanently or until replacement parts can be secured. Better still, it tells how to **PREVENT TROUBLE** through proper precautions in setting up kilns and by watching out for conditions which may cause trouble if not corrected. Twenty pages—fully illustrated. Free on request to any one who can use it to advantage. Ask for Bulletin No. 389.

Vulcan Iron Works
WILKES-BARRE, PA., U. S. A.

that portland cement is ground altogether too fine. If we turned out a cement here and endeavored only to meet the specifications with a margin of safety of about 25 percent, we could not sell a barrel of it, particularly to the big ready-mixed concrete companies. We have to give them practically a high early strength cement today to meet competition. Goodness knows we don't want to do it."

"With regard to research undertaken by this company, we are at the present time pursuing active, continuing and progressive researches into the problems of perfecting the uniformity of the quality of the products from our several plants. Concomitant with and inseparable from this mission are studies directed toward improvement of the accuracy, precision, and propriety of the analytical procedures by which quality is judged; improvements in the mechanics of production, and in the procurement and optimum use of sources of improved raw materials. Simultaneously, the research activities of other individual companies, associations, and institutions are studied and integrated with the positive measures being taken within the company to originate ways and means of perfecting quality control.

"With regard to the question of durability of modern structures, in contrast to some built 25 years or more ago; if there is a fundamental difference, the principal cause for it may lie in an unbalance between the tremendous progress made in the speed with which construction is accomplished today and the lesser progress made in ability to distribute, absorb, or disperse the internally created or applied stresses resulting from the accelerated speed of construction. In short, there appears to be reason to believe that the ruggedness and the adaptability of modern concrete is not less than that of a quarter-century ago, but that the progress in improvement thereof has not kept pace with ability to 'pour' concrete and 'pour' loads on the finished structures."

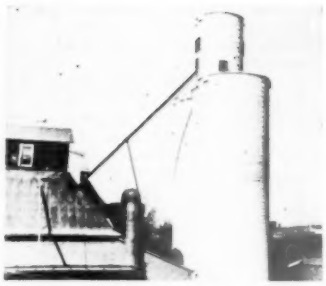
A.C.P. Appropriation, 1949; Authorization, 1950

FUNDS APPROPRIATED for Agricultural Conservation Practices in 1949 amount to $257,043,439. Amount authorized for the same purpose in 1950 totals $300,000,000. Differences in the bills as prepared by the House of Representatives and the Senate resulted in the following amendments:

No. 51: Of the sum authorized for 1950, an amount not to exceed $15,000,000 may be used for acreage allotments and marketing quotas.

No. 52: Maximum farm payment to any one participant in the program is set at $2500.

No. 53: Allotment of 5 percent of funds to Soil Conservation Service for services of technicians.



VERTICAL STORAGE THAT DEFIES THE ELEMENTS

Neff & Fry Super-Concrete Staves have the properties of stone. They are dense, impervious, noncorrosive . . . unaffected by moisture, heat, and cold . . . fire- and wind-resistant.

With grooved and beaded edges, each stave interlocks with six adjoining ones. Heavy galvanized steel rings are tightened around the structure to resist internal pressure.

If you are interested in storage bins which last for generations, get all the facts about N & F Super-Concrete Stave Bins. Write, wire or phone.

THE NEFF & FRY CO.
CAMDEN, OHIO

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- Mechanical Atomizing Oil Burners
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- Industrial Gas Burners
- Low Air Pressure Oil Burners
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- Valves, Strainers, Furnace Windows
- Tandem Block Combustion Units
- Combination Gas and Oil Burners

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NATIONAL AIROIL BURNER COMPANY INC.

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Manufacturers' News

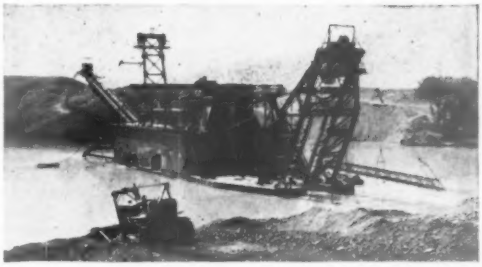
Caterpillar Tractor Co. has opened its new 929,000-sq. ft. diesel engine factory at Peoria, Ill., where machining, testing, shipping and other related engine work is accomplished under one roof and on the same floor. The machine shop alone comprises 425,000 sq. ft. and contains 1140 machines. In the assembly area, comprising around 300,000 sq. ft., 78 machines are employed, and the company points out that one man on the engine assembly line may work on 19 different engine models moving on a conveyor line. The test room is sound proof and has the capacity to test two engines at once in each of 21 test cells.

Detroit Diesel Engine Div., General Motors Corp., Detroit, Mich., has announced the appointment of A. E. Bosetti as sales engineer in the New York-New England territory including New York (except New York City and Long Island), Pennsylvania, Delaware, Maryland and West Virginia. Paul Merkert was named sales engineer in Indiana, Illinois, Missouri, Kansas and the southeastern border counties of Iowa. Lauren H. Wells, formerly zone sales engineer for West Coast distributors, will handle sales in the midwestern states not covered by Mr. Merkert. R. V. Baxley, assistant to E. F. Bentley, manager of contractors equipment sales, is handling a field sales assignment in Ohio and Michigan's southern peninsula for the balance of 1949.

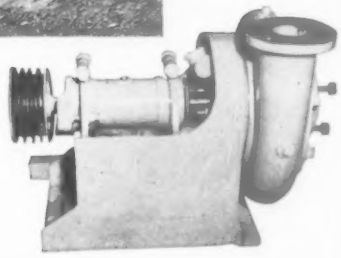
Salsbury Corp., Los Angeles, Calif., has appointed nine new distributors, as follows: Preston Faller, Seattle, Wash., for Washington, Oregon, Idaho, and British Columbia; H. G. Davis, Inc., Boston, Mass., for the New England States; Industrial Power Equipment Co., Kansas City, Mo., for Kansas and western Missouri; Thomas C. Ingerman Co., Milwaukee, Wis., for the State of Wisconsin; George C. Lever Co., Jersey City, N. J., for southern New York State and northern New Jersey; Rapids Handling Equipment Co., Buffalo, N. Y., for western New York State; Wiese Planning & Engineering, St. Louis, Mo., for eastern Missouri and southern Illinois; C. H. Collier Co., Dallas, for the State of Texas; R. F. Harrelson & Associates, Birmingham, Ala., for Alabama and northwestern Florida; and March Equipment Co., Chicago, Ill., for northern Illinois.

General Electric Co., Schenectady, N. Y., has announced the appointment of W. G. Arnold as manager of the Fitchburg, Mass., works. All services formerly assigned to the service divisions of the Lynn River works have been transferred to the Fitchburg works under Mr. Arnold's direction. A new service shop and warehouse is being erected in Richmond, Va. The company also announces price reductions on standard sump-pump motors,

3404 HOURS CONTINUOUS, TROUBLE-FREE OPERATION



Yuba No. 20 placer dredging at Hammonton, Cal., is equipped with Model "S" pumps.



Model "S" 3" Yuba sand pump used for sand pumping on jig equipped placer dredge.

Actual Performance Record of Yuba Model "S" 8" Pump

Here's what the superintendent of a Yuba 18 cu. ft. bucket line dredge wrote us under date of Oct. 4, 1948:

"For your information, the Model "S" (8") mud pump No. 880 in operation at Dredge No. 4 on Sept. 30, 1948 had completed 3,404 hours of operation without trouble or repairs."

This same customer has since purchased another 8", Model "S," and he has in use several 3" and 6" pumps of the same type.

Yuba Model "S" pump is a centrifugal type, designed especially for dredging mud, sand, or muddy water encountered in placer dredging or excavating work. Special alloys are used in castings to ensure long life with minimum loss of time for repairs. Our aim in building pumps, as with all dredge parts, is to keep your dredge running — you profit only when it is operating.

You, too, can get higher running time by equipping your dredge with Yuba pumps. For full details, write or wire us NOW.

PLACER DREDGE OPERATORS AIM AT

1. High running time
2. High yardage
3. High recovery
4. Low operating cost

They get all 4 with Yuba bucket ladder dredges.

YUBA DREDGES — PROVED DEPENDABILITY

YUBA MANUFACTURING CO.

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SHAW DARBY & CO., LTD., 14 & 19 LEADENHALL ST., LONDON, E. C. 3.

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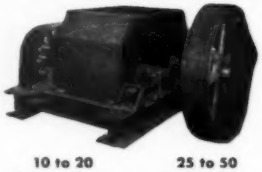
ESTABLISHED 1857
5909 Kennerly Ave., St. Louis 12, Mo.
New York - Chicago - Denver
San Francisco - Portland - Seattle

DOUBLE ROLL CRUSHERS
for
STONE - CINDERS - COAL



10 to 20 ton per hour capacity
$395.00

25 to 50 ton per hour capacity
$945.00

BONDED VIBRATING SCREENS

Make your product more salable at higher prices. Built in 1 to 5 decks, with screening areas 2 to 5 feet wide and 3 to 14 feet long. Priced from
$395.00
IMMEDIATE DELIVERY

BONDED SCALE & MACHINE CO.
1101 Bellview Ave. Columbus 7, Ohio
Phone Garfield 2186, University 2832, Eves.
Manufacturers of Scales, Conveyors, Idlers, Vibrating Screens, Crushers and Feeders.

oil-burner motors, belt-drive fan motors, and certain horsepower ratings of standard jet-pump motors.

Lippmann Engineering Works, Milwaukee, Wis., held its second annual special sales and service school for distributors and salesmen recently in Milwaukee. Of special interest were the new Grizzly-King crushers, Screen-All vibrating screen, Life-Sealed ball bearing idlers, Gyra-Gnome cone crushers, Circuit Rider self-propelled screening, crushing and loading plants.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., has appointed J. L. McDermott as manager of the Ryertex division. He succeeds Kenneth T. MacGill who is retiring after 32 years of service with the company. Mr. McDermott was formerly western sales manager of the Ryertex division.

The Torrington Co., Torrington, Conn., and South Bend, Ind., has appointed Richard W. Berg as district manager of the Pittsburgh office. He has been district engineer in the Pittsburgh territory since 1945.

Hewitt-Robins, Inc., Buffalo, N. Y., announces that the Mine Service Co., Lothair, Ky., has been appointed Hewitt Rubber Division distributor in the counties of Perry, Letcher, Knott and Leslie, Ky. The company will also represent Robins Conveyors Division.

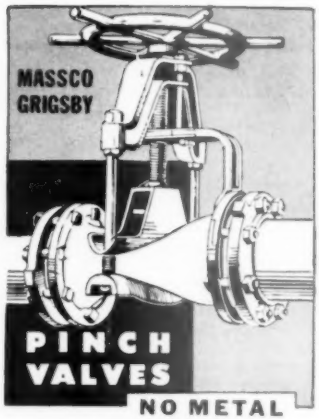
Link-Belt Co., Chicago, Ill., announces the appointment of J. H. Oakes as sales manager for enclosed drives, with headquarters at the Philadelphia plant. He will be assisted by Harry F. Kurz as representative, with headquarters at the Chicago plant. Roy E. Jones, formerly assistant export manager, has been named export manager, with headquarters in New York, to succeed Cary A. Woerwag, who is retiring because of ill health.

St. Regis Paper Co., New York, N. Y., has announced the election of Arch Carswell and Reginald L. Vayo as vice-presidents. Mr. Carswell joined the company in 1928 and became general sales manager of the Multiwall Bag Division in 1948. He will continue in charge of sales for that division. Mr. Vayo, who has been with the company since 1945, will direct sales of Kraft paper and board as well as pulp.

Stearns Mfg. Co., Inc., Adrian, Mich., has appointed the Concrete Products Supply Co., Minneapolis, Minn., as distributor in Minnesota, North Dakota, South Dakota and northern Iowa. Don Lang and LeRoy Nelson are owners of the company.

R. G. LeTourneau, Inc., Peoria, Ill., announces that a 10,000-mile airplane trip was recently made by four sales executives of the company, namely, R. P. Nichols, D. K. Heiple, E. E. Weyeneth and H. R. McQuarrie. They visited 48 heavy equipment distributors in 18 cities in the United States and Canada.

U. S. Atomic Energy Commission, Washington, D. C., announces the appointment of Walter L. Maxson, vice-president of the Oliver Iron Min-



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Recommended for transporting abrasive and/or corrosive pulps and liquids, where severe wear makes replacement of metal valves too costly. Rubber or synthetic sleeve closes tight even on solid particles. No packing glands; not affected by freezing or scale formation. Sizes 1", 2", 3", 4", 6", 8", 10" and 12" dia.

MINE & SMELTER SUPPLY COMPANY
Denver Salt Lake City El Paso
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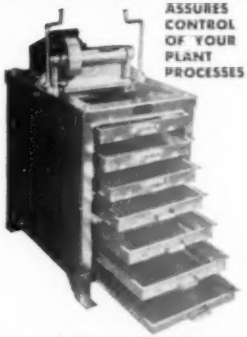
GILSON
MECHANICAL TESTING SCREEN



ASSURES CONTROL OF YOUR PLANT PROCESSES

8 GILSON FEATURES
- Makes tests quickly and accurately
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- Visible separation to refusal
- Few moving parts to wear out
- Engineered for long and practical service

Let us send you complete information.

GILSON SCREEN COMPANY
BOX 186 MERCER, PA.

ing Co., Duluth, Minn., to the Atomic Energy Commission's Advisory Committee on Raw Materials.

The Gene Olsen Corp., Adrian, Mich., announces that the Llewellyn Machinery Co., Miami, Fla., has been appointed distributor for southern Florida.

Arkell & Smiths, New York, N. Y., multiwall bag manufacturers, has announced the appointment of H. C. Peterson as sales manager.

Worthington Pump & Machinery Corp., Harrison, N. J., announces that Hobart C. Ramsey has been elected president of the company, succeeding Clarence E. Searle who has been named vice-chairman of the board of directors. Edwin J. Schwanhausser has been appointed executive vice-president, and John J. Summersby, who has been assistant vice-president and general sales manager since 1937, has been named to succeed Mr. Schwanhausser as vice-president in charge of sales. Announcement has also been made that the water treating equipment sales division has been transferred from the Harrison Works to the Dunellen Works, Dunellen, N. J.

American Hoist & Derrick Co., St. Paul, Minn., announces the appointment of John E. Carroll as general sales manager. Mr. Carroll started to work for the company in 1937 as a district sales representative, resigning to become a partner in the firm of Harron, Rickard & McCone Co. of Southern California, heading the construction equipment division.

Hyster Co., Portland, Ore., has appointed Theron Howard as manager of the Peoria, Ill., plant. He was formerly head of tractor sales and service in the Eastern division. J. F. Lewis, formerly in charge of production and purchasing at the Peoria plant, has been transferred to Portland as chief production engineer.

Walter Motor Truck Co., Queens, L. I., N. Y., has announced the appointment of Clinton A. Misson as president and a director of the company, succeeding the late L. G. Stelzle. Maurice Walter continues as vice-president and will also serve as chairman of the board.

General Motors Corp., Truck & Coach Div., Detroit, Mich., has announced the appointment of R. C. Woodhouse, formerly regional manager at Dallas, Texas, as assistant general sales manager of the truck division at Pontiac. R. E. Holsaple has been promoted to metropolitan sales manager in charge of four retail operations in Chicago. He will be succeeded as zone manager in Charlotte, N. C., by G. R. Blackburn, and A. B. Campbell, assistant manager, will assume Mr. Blackburn's position as manager of the sales organization and analysis department in Pontiac. W. P. Smith has been named retail store manager in Cleveland, taking over this position from Glenn G. Bennett who has resigned to take a GMC

Provides Performance Never Before Attainable In Small Type Excavating Equipment

Model 310 General ¾ Cu. Yd. Power Shovel.

Among the numerous advantages of this new type, crawler mounted GENERAL are 100% air control of basic motions through an air actuated, finger touch lever system . . . "Air Cushion Clutch" on reversing and retract mechanisms . . . bigger, easier operating brakes . . . larger shafts and liberal use of anti-friction bearings . . . deck gears recessed, fully enclosed, and running in oil . . . live, independent, worm driven boom-hoist with power up and power down for Crane, Dragline, and Clamshell service . . . independent travel, two speeds in either direction, steers without stopping . . . drumshaft operates in anti-friction bearings and end is capped with a lifetime, dustproof, GENERAL designed seal.

The GENERAL MODEL 310 is available with independent chain crowd shovel boom assembly, with crane boom for clamshell, dragline, and hookblock work, and as a hoe. Boom assemblies can be changed with a minimum of effort in the field.

●

These new features with the many others provided on the Model 310 give you increased earning power which will pay for the cost of the machine in a very short time. Write for complete details.

POWER SHOVELS • CRANES • DRAGLINES • CLAMSHELLS • BACKHOES • PILE DRIVERS

THE OSGOOD CO. O-G THE GENERAL CO.
EXCAVATOR
MARION OHIO

DIESEL GASOLINE OR ELECTRIC POWERED • ⅝ TO 2½ CU. YD. • CRAWLERS & MOBILCRANES

LONGER PRODUCING LIFE BUILT INTO
FARREL-BACON
CRUSHERS

Permanent strength and operating efficiency is engineered into these crushers at every vital point. Farrel-Bacon will provide industrial units or completely designed and equipped plants, including screens, elevators and conveyors. Also other types of mine, quarry, sand and gravel plant machinery. *Write for complete information.*

FARREL-BACON
ANSONIA, CONNECTICUT

Tonnage
AT LOWER COST
• Cleveland Wire Screens produce more stone per section because they are made of better grade spring steel and expert craftsmen do the job. Extra tonnage and increased dollar profits will be yours when you install Cleveland Wire SCREENS on your vibrating equipment.
There's a Cleveland Wire Screen for Every Purpose
NO PULL-OUT • NO SAG • LONGER SERVICE
EASY TO CHANGE • EXTRA STRENGTH
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• Ask for Bulletin No. 6 for details on heavy duty wire screen sections for vibrators. Available in many types of hooked edges.
THE CLEVELAND WIRE CLOTH & MFG. CO.
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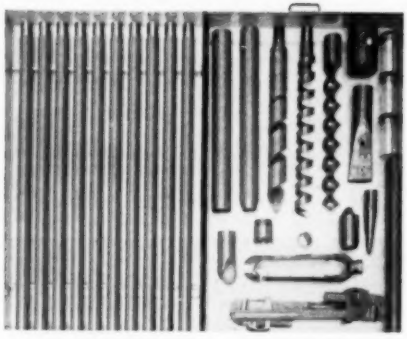
SOIL SAMPLING KIT



TWELVE SOIL AND EARTH SAMPLING TOOLS IN HANDY STEEL BOX

CAN BE CARRIED IN ANY AUTOMOBILE

ACCURATE SAMPLES OF EARTH AND SOIL MATERIALS

Thirty years' experience has proved these tools will recover accurate samples from practically all earth materials.

MANY USES include exploring aluminum silicate deposits — brick and clay materials — foundation test borings — gold bearing sands — kaolin and clay for ceramics — sand and gravel pits — subgrade testing for highways and airfield runways — base materials. For soil cement stabilization.

SEND FOR LITERATURE

ACKER DRILL COMPANY, INC.
SCRANTON 3, PENNSYLVANIA

dealership in Phoenix, Ariz.

American Management Association, New York, N. Y., has announced the award of the 1948 Gantt Memorial Medal to Fowler McCormick, chairman, International Harvester Co., Chicago, Ill., for "distinguished achievement in industrial management as a service to the community." This award has been made each year since 1929 by the Association and the American Society of Mechanical Engineers in memory of the achievements of Henry Laurence Gantt, pioneer management engineer.

The Thew Shovel Co., Lorain, Ohio, originator of the full-revolving shovel, is celebrating its 50th anniversary this year as a corporation. Captain Richard P. Thew designed and built the first of these shovels in 1895. After four years of operation as a personal business, The Thew Automatic Shovel Co. was incorporated in 1899, and later re-incorporated as The Thew Shovel Co.

The Dorr Co., New York, N. Y., has appointed Roy Johnson as manager of the Central industrial division, with headquarters in Chicago. This territory was previously handled by H. W. Hitzrot of New York, in addition to his regular duties as manager of the Eastern industrial division.

Athey Products Corp., Chicago, Ill., has announced the appointment of Reid Evans as district representative for the North Central area, with headquarters at Urbana, Ill. He was formerly branch manager of the Ohio Machinery Co., Toledo, Ohio. Marvin B. Stanley has been made sales and service representative for the states of California, Nevada and Arizona. He has been Pacific Coast service representative since 1940, and will make his headquarters in San Leandro, Calif.

New Holland Mfg. Co., Mountville, Penn., has appointed Miller, Bradford & Risberg, Inc., Eau Claire, Wis., as distributor in eastern Wisconsin and the northern peninsula of Michigan.

Reardon Industries, Cincinnati, Ohio, has opened an office and plant in Houston, Texas, with Donald Dillon as manager.

Olin Industries, Inc., East Alton, Ill., has announced acquisition of certain assets of two plants for the manufacture of railway fusees and torpedoes, namely the Central Railway Signal Co., Inc., Peru, Ind., which will now become the Central Safety Signal Division of Equitable Powder Mfg. Co., an affliate of Olin Industries, with headquarters in East Alton, Ill., and the Pacific Railway Signal Co., Los Gatos, Calif., which will become a division of Columbia Powder Co., also an Olin subsidiary, with headquarters in Tacoma, Wash.

Truck-Trailer Manufacturers Association, Inc., Washington, D. C., announces that Peter V. Moulder, executive vice-president of International Harvester Co., Chicago, Ill., was one of the speakers at the annual Summer meeting in Chicago.

United States Rubber Co., New York, N. Y., has announced the appointment of F. M. Urban, formerly manager of the mechanical goods division, as sales manager of engineered rubber products, with headquarters at the Fort Wayne plant. H. Leon Moran, manager of engineered rubber products since 1946, has been made factory manager at Fort Wayne.

Electric Machinery Mfg. Co., Minneapolis, Minn., has appointed Alfred J. Kroog as sales representative for the State of Georgia, with headquarters at Decatur, Ga.

Western Machinery Co., San Francisco, Calif., has announced the appointment of Leigh Jones as manager of the Denver, Colo., industrial sales office. He was formerly assistant manager of industrial sales at Phoenix, Ariz.

Pennsylvania Crusher Co., Philadelphia, Penn., a division of Bath Iron Works Corp., announces the appointment of John A. Plimpton as division manager. He was formerly district manager in New York City and succeeds Stanley D. Hartshorn, who has completed 25 years of service with the company as sales engineer, sales manager, and general manager. Mr. Hartshorn will remain active as consultant on sales and engineering problems, and as independent sales agent in New York State and eastern Canada.

Link-Belt Co., Chicago, Ill., has moved the Cleveland office, headed by Paul V. Wheeler, district manager, to 314 Hanna Building. The Baltimore office, of which Charles C. Wiley is district manager, has been moved to 2315 St. Paul St., and the office in Huntington, W. Va., headed by David W. Stevens, has been moved to 1009 Fifth Ave. The Office in Newark, N. J., headed by John D. Riley, district manager, is now located at 31 Clinton St.

The Lincoln Electric Co., Cleveland, Ohio, has completed arrangements for construction of an $8,500,000 plant in Euclid, Ohio. It is expected the plant will be ready in 1950 for transfer of all manufacturing operations from the present plant.

Farrel-Birmingham Co., Inc., Ansonia, Conn., announces the appointment of Warren M. Pike as New England representative, with headquarters in Boston, Mass., to handle sale of gears and gear units manufactured at the Buffalo, N. Y., plant.

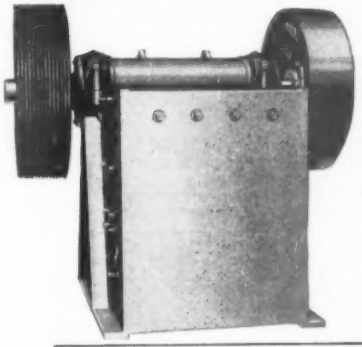
Westinghouse Electric Corp., Pittsburgh, Penn., has announced the appointment of Tomlinson Fort as manager of the apparatus sales department. He succeeds James H. Jewell who recently was appointed vice-president in charge of sales. William W. Sproul has been named sales manager of industrial products, and Royal C. Bergvall, engineering manager of industrial products. Mr. Sproul was formerly transformer sales manager. Mr. Bertvall has served as assistant to the vice-president in charge of engineering since 1938.

There is no GOOD substitute for Staged Rock Reduction . . .

ROGERS JOPLIN

JAW CRUSHERS

Jaw crushers . . . the balancing unit in the material reduction circuit and one of the most important factors affecting the final cost of the finished product. Rogers crushers, in 18 sizes, are individually designed and correctly proportioned with long crusher jaws placed at the correct angle to secure superior crushing action, greater capacity, less slippage, less wear and less replacement costs. Bearing sizes are from two to three sizes larger than normally recommended . . . shaft diameters are likewise oversize, assuring freedom from breakdown and long, trouble-free service.



PRIMARY CRUSHERS IN 6 SIZES
SECONDARY CRUSHERS IN 12 SIZES

● Write for this folder on Rogers Jaw Crushers for more complete information. If you have a specific problem, consult our Engineering Department, no obligation.

ROGERS IRON WORKS CO.

JOPLIN, MISSOURI

More CAPACITY per square foot of screening area!

More ECONOMY per square foot of screening area!

That's a UNIVERSAL!
A wide range of models to meet your requirements.

Write today for new Catalog No. 109 on Screens and Screening.

Type "Me" 42"x96" Double Deck

UNIVERSAL VIBRATING SCREEN CO.
RACINE - - WISCONSIN

If you want

UNINTERRUPTED KILN PRODUCTION

then use **PYRASTEEL** Kiln ends

Continuous, economical kiln production is assured when PYRASTEEL Kiln Ends are on the job — no more burnouts and costly shutdowns!

PYRASTEEL protection is needed at both the feed end and discharge end of the kiln . . . and the segmental sections are easy to install at these points.

Over 76% of the annual output of cement in the U. S. is produced in plants using either one or both of our alloys, PYRASTEEL and EVANSTEEL.

PYRASTEEL is especially effective in all high-heat applications up to 2000° F., such as feed pipes, clinker coolers, conveyor screws, and drag chains.

In the past 20 years over 1000 PYRASTEEL Kiln Ends have been installed. Some have lasted for 15 years without a failure.

Unit Segments are easy to install or replace.

CHICAGO STEEL FOUNDRY COMPANY

Kedzie Ave. & 37th St., Chicago 32, Ill.

MAKERS OF ALLOY STEEL FOR OVER 35 YEARS

Write for PYRASTEEL Bulletin

Sauerman Stackline Cableway digs gravel from lake and delivers 75 cu. yd. an hour to plant at cost of few cents a yard.

Dig, Haul, Dump at Lowest Cost

with a

SAUERMAN MACHINE

This shows how a Sauerman scraper with high tail tower handles a 25,000-ton stockpile of phosphate rock at Florida drying plant.

GRAVEL excavation and stockpiling are two jobs at which Sauerman Scrapers and Cableways excel. This long range equipment is very flexible and is easily adapted to the exact requirements of each particular job, whether working deep under water, in a clay formation, on a hillside, in a swamp, or moving bulk materials into and out of stockpiles.

The first cost of a Sauerman installation is reasonable, maintenance amounts to very little, and the simplicity of operation makes it possible to place the control of even the largest installation in the hands of one operator. Write or wire for Catalog.

SAUERMAN BROS., INC.

530 S. Clinton St., Chicago 7, Ill.

Subgrade Specifications for Turnpike Extension

SPECIFICATIONS for the special subgrade material to be used as an insulation course under portland cement concrete pavement in the construction of the Eastern extension of the Pennsylvania Turnpike have been released by the Pennsylvania Stone Producers Association. Four different gradations are acceptable for use. The special subgrade course may be composed of broken, crushed, run-of-crusher or run-of-bank stone or slag; sand, sand and gravel or run-of-bank gravel, or any combination of these materials.

The materials must meet one of the following gradations except as noted below:

Percent Passing	No. 1	No. 2	No. 3	No. 4
4-in. sieve	100			
2½-in. sieve		100		
1½-in. sieve	40-90		100	
¾-in. sieve		40-90		
½-in. sieve				100
No. 4 sieve			40-90	
No. 10 sieve				40-100
No. 200 sieve	0-30	0-30	0-30	0-30

When the completed mixture contains more than fifteen percent passing the No. 200 sieve, the plasticity index of the portion passing the No. 40 sieve must not exceed six. The plasticity index is determined by current A.A.S.H.O. standard practice. Aggregate retained on the ⅜-in. sieve must be sufficiently durable to resist excessive breakage in processing and consolidation.

Gradations Nos. 1 and 2 must contain a sufficient quantity of the smaller sized particles to prevent the infiltration of the subgrade soil into the special subgrade and also to prevent excessive loss of mortar from freshly laid concrete. Special subgrade material of the same average gradation or porosity shall be used transversely between the high point and the low or drainage discharge point in order to facilitate the drainage flow and not impede it.

Types of Mine Rock

CHARACTERISTICS of more than 100 rock types obtained from various operating mines and mineral-investigation projects are listed and described in Report of Investigations 4459, "Physical Properties of Mine Rock, Part I, recently made available by the Bureau of Mines. The report includes a tabulation of 11 different physical properties for each type of rock tested, as well as the source and geologic classification of each.

Merger

OHIO RIVER SAND CO., INC., Louisville, Ky., was formed recently by merger of the Ohio River Sand Co. at Louisville, and River Coal and Supply Co., Inc., New Albany, Ind. The new corporation has $1,000,000 common stock and $644,700 of 6 percent accumulative stock.

Tramway

(Continued from page 160)

duction requirements made it evident that the existing quarry, on 2650-ft. Crosby Mountain, would be insufficient. The old quarry had been operated since 1929 and quality of the rock, although still above requirements, was not all that the company desired.

The old quarry is served by a continuous bi-cable tramway, whereas the new quarry is served by a reversible bi-cable tramway system, selected because of the large capacity required, the distances involved and the necessity of moving many heavy pieces of equipment in to the quarry over the cables as the only means of transportation.

Contract for the new aerial tramway was awarded to the Washington Iron Works, Seattle, in 1945. That summer, a camp was constructed at the 1850 ft. elevation, a 3-mi. access road built to the midpoint of the two-section tramway at an elevation of 2950 ft., and heavy timber logged off the right-of-way. All preliminary work was done over trails with pack horses and later with four-wheel drive trucks, over access roads frequently steeper than 20 percent grade. Final erection details were completed in late 1948 and the tram placed in experimental operation for a short time before snow halted work.

Because winter snows reach a depth of 21 ft., all buildings had to be reinforced to withstand the snow weight and the roofs pitched steeply. Because rainfall is heavy during the late spring and early fall, large ditches were necessary to insure the maintenance of the steep-gradient access roads on the company's property.

Material Handling Problems

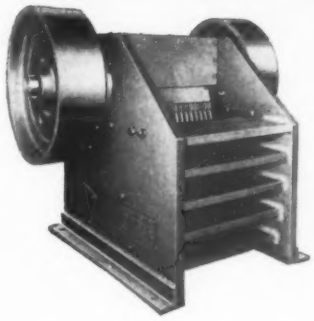
The upper section of the tramway involved considerable difficulties in material handling due to the problem of access. With a single span of 3000 ft. and difference in elevation of 1100 ft. between the two ends, special rigging equipment was necessary for stringing the four 1¾-in. cables across the canyon. All sand, gravel, cement and water were hauled across a pioneer line to form the mix for a 400-ton concrete anchor embedded in solid rock for the cable anchorage at the top.

All preliminary hoisting was accomplished with a gypsy-type gasoline-powered hoist using an endless line. The first line across the canyon was a ¼-in. cable which was carried to the top by pack horses and then strung back down over the cliffs by hand. This was run through a rigging block at the top and the hoist at the lower end hauled successively larger cables across the span.

All equipment, including a complete crusher plant, bunkhouse and cookhouse material and accessories, was transported over the 3000-ft. span

(Continued on page 209)

OUTPUT...RESULTS



Let us send you performance data on these modern, large capacity primary jaw crushers. For many years, in many places, they have been faithfully paying their way. Noted for greater strength per pound crusher weight!

Sizes: 10"x16" to 20"x36". Capacity: 20 to 1800 tons daily.

Just clip this ad — attach to your letterhead and mail

Eagle jaw crushers and pulverizers are known for high capacity and all around efficiency. Years of field experience.

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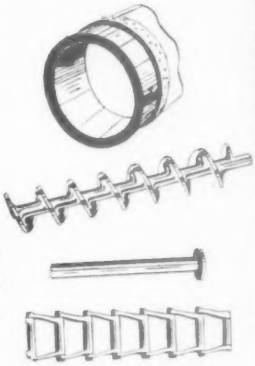
JAW CRUSHERS · IMPACT BREAKERS
PULVERIZERS · CONVEYORS · LOADERS

CRUSHER CO., Inc. GALION OHIO·U·S·A

Fahralloy Cement Mill Castings *Fight* Heat and Corrosion

FAHRALLOY chromium-nickel alloy castings give outstanding service on cement mill equipment, where heat, corrosion and abrasion are involved.

Fahralloy castings are ideal for sectional and segmental kiln ends, feed pipes and spouts, hoppers, clinker coolers, conveyor screws, drag chain and other parts. A modern foundry under complete laboratory control. Let us quote on your requirements. Engineers available for consultation.



THE FAHRALLOY COMPANY

15100 S. Lexington Ave., Harvey, Ill. Canadian Plant: Orillia, Ontario.

Visitors viewing thermal expansion furnace in new laboratory

Refractory Laboratory

(Continued from page 170)

portant purpose of the book is to provide the engineer or purchaser of refractories with up-to-the-minute technical information relating to fire-clay products. A considerable portion of the volume is devoted to technical tabulations and mathematical tables relating to the construction and/or use of fire-resisting refractory products. The book *Refractories* has a separate chapter on the "Rock Products Industries" and it describes the types of brick recommended for rotary and other types of kilns for both lime and portland cement manufacture. The volume represents many years of study and compilation, and was prepared coöperatively by the General Refractories Co. and its advertising representatives, McLain-Dorville, Inc., Philadelphia, Penn.

After the opening ceremonies for the new laboratory were completed, the group was split up into several sections and members of the research staff acted as a guide for each section. They explained the operation and purpose of the many pieces of scientific equipment installed in the laboratory.

Laboratory Equipment

The new laboratory has complete chemical and physical facilities for studying refractories in all stages from the raw material through the manufacturing processes to the final use in furnace operation. Petrographic microscopes, X-ray machines, the spectroscope, and high frequenty induction furnaces all contribute to the production of better refractories. An experimental pilot plant is also provided whereby all manufacturing processes may be carried out on full commercial scale and under the strict control of the laboratory. In addition, the unit has a large testing division for evaluating the qualities of the pilot plant products. The behavior of experimental bricks under the destructive forces of high temperature, static load, rapid changes of temperature, corrosive slags, gasses, etc., is carefully determined.

It was pointed out that through recent research by the staff of the laboratory, several types of ganister or quartzite, and clay deposits that were supposed to be identical, are now producing many types of clay, each with their own refractory properties.

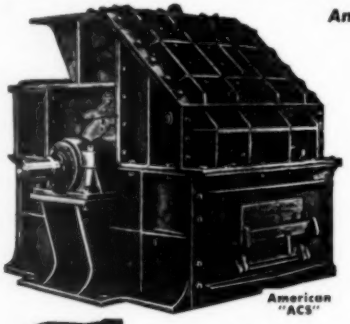
After inspecting the laboratory, the group was shown through the Baltimore plant and saw how the new type of suspended refractory Steelklad Ferroclip, using the company's Ritex process of manufacturing refractory shapes, was carried out.

Hosts at the General Refractories Co. Baltimore research laboratory opening included Floyd L. Greene, president; Dr. Russell P. Heuer, vice-president in charge of research; Louis J. Trostel, manager, Baltimore laboratory and A. E. Fitzgerald, manager of research with headquarters in the Philadelphia office.

Handbook for Uranium Prospectors

THE U. S. ATOMIC ENERGY COMMISSION and the U. S. Geological Survey have announced publication of a 123-page, pocket-sized handbook for uranium prospectors, entitled, "Prospecting for Uranium," the publication provides information on the occurrence, identification and sale of uranium-bearing ores, and is available from the Superintendent of Documents, U. S. Government Printing Office. It is said to answer more than 5000 inquiries received by government agencies about the ore.

WHAT'S THE SIZE OF YOUR CRUSHING JOB?



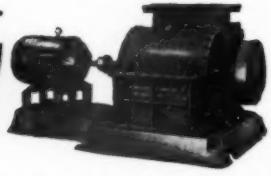
Americans offer the action and the capacity you need.

For heavy-duty reduction of one-man size to roadstone or agstone the American "ACS" Hammermill offers 3 sizes — up to 250 TPH.

Center feed models produce a higher ratio of fines through longer travel of stone in hammer cycle. Front feed models minimize fines.

American "30"
Sizes up to 100 TPH

American "24"
Sizes up to 50 TPH



Send for "Better Stone Crushing" Booklet

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1245 MACKLIND AVE.
ST. LOUIS 10, MO.

Tramway

(Continued from page 207)

on four 1⅝-in. cables with special rigging and hoisting machinery. Loads were as heavy as 13 ton.

The new tramway connects into the existing tramway at 1800 ft. elevation. Each section of the new line uses two 5-ton capacity automatic dumping buckets operated by gravity at a speed of 1000 f.p.m., while the existing tramway has 70 buckets of 1500-lb. capacity each. Braking effort on the new tramway is provided by regenerative control of each section. Hoists are located immediately behind the bins because of restricted working space. Drums, 96 in. in dia. and 96 in. long, are designed to handle the lowering rope in two wraps. Spotting of buckets over the bins is facilitated by the use of a tail rope.

On the upper section, each bucket operates over two 1⅝-in. dia. smooth-coil track strand cables. While the upper section is a single span of 3000 ft., the lower section has seven intervening towers over the same length. Each section is operated at the lower end by one hoist man with air-operated chute loading. Loading and discharge bins are constructed of heavy timber with steel superstructures.

The crushing plant conveyor system and bins at the loading point are completely covered to allow operation during bad weather and protect the structures from heavy snows and accumulation of ice. The roof area also aids in preventing accumulation of snow and ice with the crushed rock.

Tramway Power

Power to operate the tramway is rated at 2300 volts, 60 cycles, 3 phase. Transmission lines are carried above the tramway cables on the lower section with masts on each tower. A 1⅝-in. cable on the upper section spans the 3000-ft. gap, acting as suspender line for the three power lines. Capacitors have been installed at different stations for power factor corrections. A telephone line allows communication between operators.

From the highest point of the tramway, a 1200-ft. road with a 6 percent down-hauling grade has been blasted around the mountainside to the quarry face. Quarry-run rock is hauled to the primary crusher, which has a capacity of 200 t.p.h., by 8-cu. yd. dump trucks. A 30-in. belt conveyor on 175-ft. centers carries the rock to the bin from which it falls into the tramway buckets.

The quarry, with a narrow working face, extends about 400 ft. in elevation up to the top of a ridge and over. It is opened by a series of benches. A 1¾-cu. yd. diesel shovel loads the two trucks.

Jim Halleran is quarry superintendent and Frank Baldwin plant superintendent for the cement company. Frank G. Frink, Jr., was engineer in charge of tramway construction, with Oliver Craney, field erector.

Mine and Quarry Disasters

FIRES AND EXPLOSIONS have been the chief causes of major disasters—where five or more lives were lost—at metallic and nonmetallic mines and quarries (excluding coal mines) in the United States and Alaska during the past 80 years, according to Bureau of Mines information circular 7493 entitled "Major Disasters at Metal and Nonmetal Mines and Quarries in the United States."

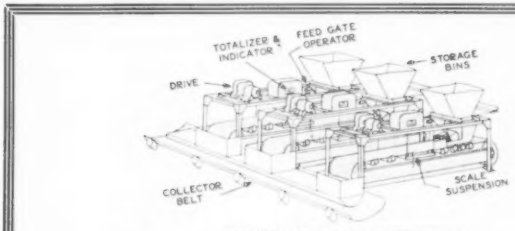
Explosions involving blasting materials, cave-ins and slides, and fatalities arising from cage trips and man cars were other causes of major disasters. Detailed information on the causes is included in the publication to point out the potential hazards at the mines and quarries and to serve as a guide in the prevention of familiar accidents.

Geologic Map of Ohio

THE GEOLOGICAL SURVEY OF OHIO has announced publication of the "Geologic Map of Perry County, Ohio," which may be obtained from the Survey at Ohio State University, Columbus 10.

Gravel Operation Sold

JOS. A. DORN GRAVEL BUSINESS, Wahpeton, N. D., has been sold to C. F. Mittag and Son.



AUTOMATIC CONTINUOUS PROPORTIONING

TRANSPORTOFEEDERS AUTOMATICALLY AND CONTINUOUSLY TRANSPORT WEIGH INDICATE INTEGRATE TOTALIZE TONNAGE AND MAINTAIN PRESET FEED RATE

SINTERING MACHINERY CORP.
Transportometer Division

70 PINE STREET
New York 5, N. Y.

4 days' work! now done in 3 with JAEGER "air plus" pressure*

Model 125 — Runs 2 heavy or 3 medium breakers or heavy rock drill at full 90 lbs.

With steady 90 lbs. pressure, instead of 70 lbs., air tools hit enough harder and faster to do 30% to 40% more work in the same number of hours.

Jaeger's new standard ratings (the first increase in the industry since 1932) give you the air you need to run today's big tools at steady 90 lbs. pressure — 75 ft. of air instead of 60 — 125 ft. instead of 105 — 185 ft. instead of 160 — 250 ft. instead of 210 — 365 ft. instead of 315 — 600 ft. instead of 500.

If you're interested in cost-cutting — producing 4 days' work in 3 — put a Jaeger Air Plus on your next job.

Model 600 — Runs 2 big 4" wagon drills at 90 lbs., drilling 30% to 40% more footage than you get with any 500 ft. compressor.

See your Jaeger distributor or write

THE JAEGER MACHINE CO.
Columbus 16, Ohio Cable: BIGANLITLE

Pumps • Mixers • Hoists • Towers
Bituminous Pavers • Aggregate Spreaders
Concrete Spreaders • Finishers

HAMMOND

Multi-Wall

SEWN • PASTED • OPEN MOUTH • VALVE STYLE

BAGS

. . . take a lot of punishment in delivering your products safely and dependably . . . without losing their attractive appearance. *They're Strong, Weather-proof, Economical!*

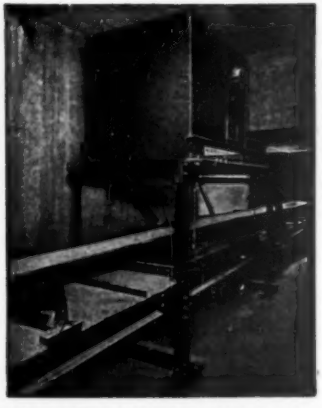
Write for quotation on your needs!

HAMMOND BAG & PAPER CO.

GENERAL OFFICES: WELLSBURG, W. VA.

Plants in Wellsburg, W. Va., and Pine Bluff, Ark.

YOU *Too* CAN PROFIT WITH EQUIPMENT BY MERRICK



WEIGHTOMETERS

Are in daily use throughout the world continuously and automatically weighing and recording the weight of materials carried on belt conveyors. Operating without interruption to conveyor flow or requiring the services of an attendant.

FEEDOWEIGHTS

In the CEMENT INDUSTRY have long played a vital role in increasing the production and quality of finished cement. The FEEDOWEIGHT is admirably suited for accurate *batching, blending, proportioning and feeding* to process such Cement components as Limestone, Clinker, Gypsum, etc.

Write us today for full details

MERRICK SCALE MFG. CO.

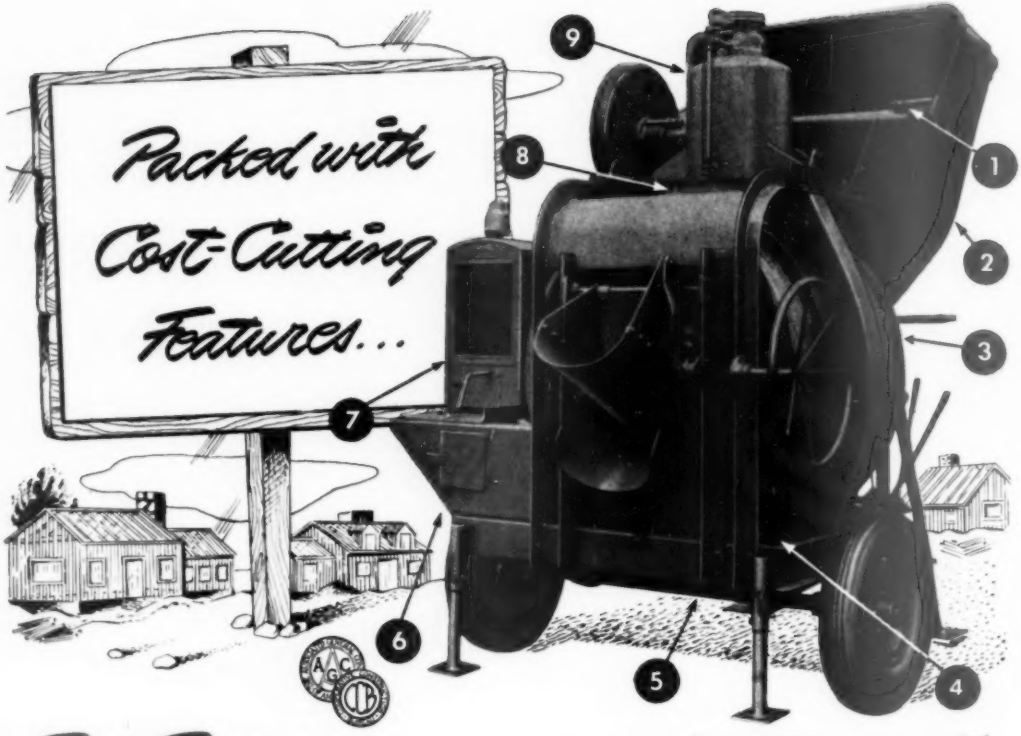
180 AUTUMN STREET • PASSAIC, NEW JERSEY

CONCRETE PRODUCTS

CONCRETE UNITS · READY-MIXED CONCRETE

Batching plant of Lafayette Fuel and Supply Co., Inc., Clemmons, Md.

A SECTION OF
ROCK PRODUCTS



BLUE BRUTE design shows you what to look for in a portable mixer

Give a Worthington-Ransome Blue Brute 11-S or 16-S Portable Mixer a thorough going over — and get a real revelation of how far mixer-design has advanced! For example: ❶ *skip cable* winding shaft, mounted on self-aligning bearings, has grooved spools for longer cable life; ❷ *power loader* with automatic knock-out and brake set when skip raises to charging position; ❸ *skip vibrator*, simple and effective, assures quick transfer of materials from skip to drum; ❹ *drum rollers* of genuine car wheel metal with chilled treads — each roller mounted on two Timken bearings; ❺ *roller sub-frame* under drum prevents concrete accumulation on roller shaft or bearings; ❻ *countershaft* of heat-treated alloy steel in self-aligning ball bearings — all units easily accessible; ❼ *engine* mounted with radiator facing mixer's discharge side avoids dust, clogging and overheating; ❽ *drum drive gear* of one-piece semi-steel casting, machined to true circle; ❾ *water tanks* of accurate, exclusive spiral cut-off type — no rubber to deteriorate.

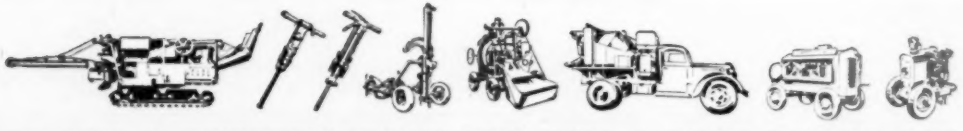
These and many other features — including Ransome's perfected mixing action, famous for producing better quality concrete — are the reasons why construction men everywhere depend on Blue Brute Portable Mixers for more concrete at less cost. See your nearby Worthington-Ransome distributor for performance facts that prove *there's more worth in a Blue Brute.* 88-S

A Blue Brute 16-S Portable Mixer speeds operations on a big housing project in Springfield Gardens, Long Island, N. Y. This machine is one of a fleet of both 16-S and 11-S Blue Brutes owned by Angelo Aragone, who says: "I am well pleased with their performance and economy."

Worthington Pump and Machinery Corporation, Worthington Construction Equipment Dept., Harrison, N. J.
Distributors in all principal cities

WORTHINGTON

BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

INDUSTRY NEWS

Precast Concrete Slabs for Grandstand Decking

PRECAST channel-shaped slabs of lightweight (pumice aggregate) concrete were used for 45,000 sq. ft. of grandstand decking in the expansion of facilities at Hollywood Park racetrack in Los Angeles. The slabs are 10 ft., 7 in. long, 18 in. wide and 6 in. deep. Wire mesh in the web and ½-in. bars in each flange reinforce the slabs which are placed side by side. To bridge an opening of about 3 in. at the top between slabs, a ⅜-in. reinforcing bar was placed before the opening was filled with grout. This, together with some overlap of the wire mesh reinforcing, bonded the slabs. The pumice aggregate permitted the units to be sawed to fit around columns and other openings in the floor system, according to Wailes-Bageman, Inc., Los Angeles, Calif., manufacturer of the units.

British Association Expands Cement-Concrete Research

RESEARCH AND DEVELOPMENT DIVISION, Cement and Concrete Association, England, has placed a research station in operation at Wexham Springs, Buckinghamshire. W. A. Fairhurst, technical director, is in charge of the research program. Facilities for testing concrete structures and precast concrete products are planned. Chemical and concrete testing laboratories are already in use.

First problems to be studied will be durability of concrete, effects of types and proportions of aggregates and mix design on the properties of concrete, methods of curing to obtain high early strength and surface finishes for architectural concrete and pavements. Effect of air entrainment on durability and possible cement-aggregate reaction in Great Britain are also being investigated.

Perlite Institute

THE PERLITE INSTITUTE was organized May 12 in Los Angeles, Calif., with approximately 45 perlite producers, representing 18 organizations, in attendance. The new association has as its purpose the development of the industry for its members by every lawful and helpful means. The various phases of activity will extend from mining, through expanding, processing and selling. Technical, membership and publicity committees were appointed.

Officers of the Institute are: president, T. C. Carter, Great Lakes Carbon Corp., New York, N. Y., vice president, J. Don Alexander, AleXitE Engineering Division, Alexander Film Co., Colorado Springs, Colo.; and members of the board, Oliver N. Gregg, Gregg Lumber Co., Grand Rapids, Mich.; C. H. Hall, Standard Perlite Corp., Pasadena, Calif., and Thomas W. Dant, Dant and Russell, Portland, Ore.

The next meeting of the group will be held September 7-9 at the Antlers Hotel, Colorado Springs, Colo.

Southern Lightweight Aggregate Corp., Richmond, Va., presented the above exhibit at the First Virginia Industrial Exposition, held in Richmond, May 9-21. Included in the exhibit were two walls of Solite building units to show texture and insulation qualities. The third wall, on the left side, was constructed with 5000 lb. of poured-in-place monolithic Solite concrete weighing 100 lb. per cu. ft. The unpainted part of this wall was rubbed to expose the Solite aggregate. Films on tilt-up and concrete masonry construction were presented by the Portland Cement Association. Approximately 50,000 visitors were in attendance

S AND G CONCRETE CO., Wilmington, N. C., has announced plans to establish a new batching plant at Laurinburg, N. C., to furnish ready-mixed concrete for a street improvement job.

CEMENT PRODUCTS CO., Mansfield, Ohio, is manufacturing pumice block in addition to its regular line of concrete and cement-cinder block and brick. Present plant capacity is 10,000 standard block per day. H. J. Schmitz is owner of the firm.

FETZER CONCRETE BLOCK AND PRODUCTS CO., Shelby, N. C., has completed its improvement program and is now in production of redi-furred block, Tom Fetzer, Jr., proprietor, has announced.

CONCRETE PRODUCTS CO., Charlotte, N. C., is producing a fabricated one-piece, two-compartment, steel-reinforced concrete tank of 1000-gal. capacity as a solution to a septic tank problem created in the Piedmont Carolinas last winter by numerous septic tank failures. The units have been approved by city and county health departments. E. R. Zimmerman is president of the concrete products firm.

LOWELL HALE has formed a partnership to operate the Snedecor and Hale Concrete Products Co., Eldorado, Ill.

MEEKIN CONCRETE PRODUCTS CO., Hollywood, Fla., has announced plans to expand its present plant. According to C. Meekin, president of the firm, the expansion program will consist of a new office building, block plant, additional machinery and new crushing equipment.

ROTH BUILDING AND SUPPLY CO. has set up a ready-mixed concrete plant at Sheboygan, Wis., John Reiss, president of the firm, has announced. This is in addition to the company's block plant, and cement and limestone operations.

CENTRAL BUILDING SUPPLY CO., St. Paul, Minn., has started production of cinder-block which carry the name "Cindercrete." The firm also manufactures Celocrete block.

HOLLOSTONE CO., INC., Hollywood, Calif., recently observed its 25th year in business. Jack Allen is general manager of the firm which manufactures concrete block.

CONCRETE, INC., has been established at Liberal, Kan., by L. V. Jackson for the production of ready-mixed concrete. Present capacity is 150 cu. yd. per day.

THOMAS CONCRETE PIPE CO., Corpus Christi, Texas, is manufacturing 21 sizes and types of "pyramid" pumice masonry units at the rate of 4500 to 9000 per 8-hr. day, using a Besser vibrapac machine. Ray I. Thomas is owner of the firm.

DOX BLOCK SYSTEM, INC., Milwaukee, Wis., has been organized with 500 shares, no par value, and a minimum capital of $10,000, to manufacture concrete block and all types of building materials. Bernard, Leona A. and L. J. Vander Heyden are the principals.

WE SALUTE THESE

Salesmen of Security

The executives of the more than 20,000 companies that have sponsored the Payroll Savings Plan

The 7,500,000 workers who are each investing on the average of $20 per month in Savings Bonds

The employees who serve as volunteers selling U. S. Savings Bonds to their fellow employees

Here's a sales force that's helping to win economic peace of mind for the nation. It already has dealt heavy blows to inflation, fear, and doubt. *This sales force is comprised of people who really are doing something to build security and protect the American way of life.*

They are building security for themselves by buying Bonds. Every $3 they invest will pay $4 at maturity.

They are building security for their companies. As each Bondholder's own sense of security increases with his Bond purchases, he becomes a better worker. Plant morale improves. Production increases. Absenteeism, labor turnover, and the accident rate all decline. Concurrently relations between employer and employee improve.

They are building security for the nation. Savings Bond dollars are deferred purchasing power—an assurance of good business to come. The Treasury uses net Savings Bond dollars to fight inflationary credit potential in the banking system by retiring short-term bank-held Federal securities.

If your company isn't an active part of this sales force, better join now and get in on the benefits! Full information is available from your State Director, Savings Bonds Division, U. S. Treasury Department. Phone him or write the Treasury Department, Washington 25, D. C.

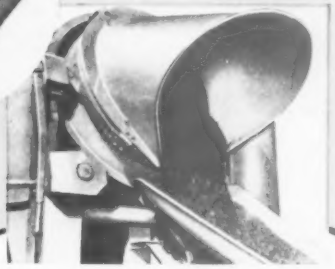
The Treasury Department acknowledges with appreciation the publication of this message by

ROCK PRODUCTS

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.

Maximum loading and discharge speed with MINIMUM SEAL MAINTENANCE made possible with this exclusive Hi-Boy feature. The molded rubber seal is never broken! For faster charging, the entire diameter of the cone end of mixing drum is utilized — a 32" unrestricted opening. A latch holds hopper in upright position to receive material. Leakage of grout or water is eliminated.

There's no gate to open for discharging. Latch releases, permitting hopper to rotate 180° by movement of mixing drum. Hopper is entirely supported by mixing drum. Excessive wear and seal failure eliminated. Hopper is automatically held in inverted position. No confining chute necessary.



"THE NEW REVOLVING HOPPER

permits fast charging and fast, clean discharging—eliminates maintenance costs to a remarkable degree."

says: H. L. Stoneburner, Jr.
John Griffiths & Son Construction Co.
Chicago, Illinois

JOHN GRIFFITHS & SON CONSTRUCTION CO.
BUILDERS
BUILDERS BUILDING
228 NORTH LA SALLE STREET
CHICAGO 1 March 10, 1949

Blaw-Knox Division
of Blaw-Knox Company
Peoples Gas Building
Chicago 3, Illinois

SUBJECT: HI-BOY TRUCKMIXERS

Attention: W.C. McQuide, Vice President, District Sales.

Gentlemen:

Beginning early in April of last year, we have operated a fleet of eight Hi-Boy Truckmixers continuously. During that time we have found them entirely satisfactory in all requirements of high speed, efficiently inspected concrete production and placing most satisfactorily.

The revolving hopper permits fast charging and fast, clean discharging. It also eliminates maintenance costs to a remarkable degree.

As evidence of our satisfaction, we will, in the near future, place orders with you for additional units.

Very truly yours,

JOHN GRIFFITHS & SON CONSTRUCTION CO.

H.L. Stoneburner, Jr., Vice President.

HLS:ecg

That's one reason for the nation-wide acceptance of Hi-Boy BLAW-KNOX TRUKMIXERS

Performance records of the Hi-Boy Trukmixer, with its new Revolving Hopper, are bringing us letters like this from Ready-Mix Operators all over the country! They all agree that the high-speed charging and discharging cycle, even with zero slump concrete, and the trouble-free operation, are the main reasons for the Hi-Boy's nation-wide acceptance. The higher daily payload average of the Hi-Boy means more money in your pocket.

In addition to steady high-yardage production, Hi-Boys mix concrete thoroughly and uniformly, discharge *all* the concrete in the drum without segregation. Freedom from tailgate trouble and consistently low overall maintenance costs are additional reasons why so many operators say, like Mr. Stoneburner, "As evidence of our satisfaction, we will in the near future, place orders with you for additional units."

Bulletin 2223 details all the efficiency features that keep Blaw-Knox Hi-Boys at the top of the money-making list. Send for your copy today.

More and More Operators are Turning to Blaw-Knox for a COMPLETE, ONE-SOURCE READY-MIX PACKAGE

There's everything you need in the Blaw-Knox Ready-Mix Package. It's a complete set-up to fit every requirement of your work from start to finish. A complete line of Clamshell Buckets, Batching Plants for Aggregates and Cement, Truck Mixer Loading Plants and Central Mixing Plants available in a wide range of sizes and styles for every type of job. Ask for full information.

PORTABLE AGGREGATE BATCHING PLANTS | CLAMSHELL BUCKETS | PORTABLE BULK CEMENT PLANTS | TRUCK MIXER LOADING PLANTS

BLAW-KNOX

BLAW-KNOX DIVISION of Blaw-Knox Company
Farmers Bank Bldg., Pittsburgh 22, Pa.

Birmingham • Chicago
New York • Philadelphia
Washington

Utmost Structural Stability and Fire-Safety

IN HOUSTON'S PALATIAL NEW HOTEL

NATIONWIDE interest in The Shamrock, largest hotel built since the war, naturally dwells on deluxe decor and distinguished service. But the structure itself is as sound of heart and sinew as modern building methods can make it: Strong, durable concrete throughout . . . fireproof of itself . . . *quality* concrete, every cubic yard, with mixes carefully designed to produce the full potential of strength and durability provided by cement itself of highest quality. As in New York's Waldorf-Astoria, Lone Star Cement was used exclusively in The Shamrock—a total of 50,000 bbls.

Lone Star Cements meet every construction need: LONE STAR PORTLAND CEMENT, for outstanding performance in all types of construction . . . 'INCOR'* 24-HOUR CEMENT, where dependable high early strength cuts time, form and winter costs . . . LONE STAR AIR-ENTRAINING CEMENT for highway work and many other uses . . . LONE STAR MASONRY CEMENT for quality masonry. There is added assurance in the unvarying quality of Lone Star Cements.

*Reg. U. S. Pat. Off.

THE SHAMROCK . . . . . GLENN McCARTHY, Owner
Architect-Engineer: WYATT C. HEDRICK
Construction Managers:
STONE & WEBSTER ENGINEERING CORP.
Contractors:
Foundation: R. P. FARNSWORTH & Co., INC.
Superstructure, Service Building & Garage
TELLEPSEN CONSTRUCTION CO.
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LONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 15 MODERN MILLS, 27,000,000 BARRELS ANNUAL CAPACITY

Recently completed office building of Cinder Block Inc. Interior of the cinder block walls has been left plain while the exterior has been given a coat of portland cement paint

Special Concrete Units Increase Profits

Electronic device installed on automatic block machine to regulate height of unit and for control of texture at Cinder Block Inc., plant, Detroit, Mich. New cinder block office building incorporates many pre-cast architectural specialties

By DAVID MOCINE

THERE ARE two major focuses of interest at the operation of Detroit Cinder Block Inc., Detroit, Mich. One is in the plant and the other is the new office building of this progressive concern. In the plant, one of two high-capacity block machines has recently been equipped with a device that assures "quality control," i.e., control of height, density and texture. The company's cinder-block office building, striking example of the fact that the company "specializes in specialties," will be described in the second part of this article.

Quality Control

The device for control of height, density and texture, mounted on one of the plant's two Besser Super Vibrapac automatic block machines, is the development of Messrs. Miller and Meeker, and is called the "Electro-Visor." This unit is activated electronically and controls the cycle of the block machine concrete feed box. Depending on consistency of the mix, the device adapts the machine cycle so that both height and density are always constant. When the mix is dry, for example, the period the feed box remains over the mold box is shortened so that excessive concrete will not be vibrated into the mold. The same is true, in reverse, for a wet mixture. In the words of A. V. Leese, production manager, results obtained from the control unit are "very satisfactory."

Cinder Block Inc., has been an exclusive user of cinders for concrete aggregate for 25 years, carrying cinder concrete into use for all specialties in addition to block. The company's cinder processing plant receives over 100,000-cu. yd. of cinders annually from the power plants of The Detroit Edison Co. The major share of these cinders is used in the company's production of concrete products, which includes five to six million 8-in. equivalent block per year on a two-shift basis. Cinders are hauled to the plant by a contract trucker and dumped to ground storage, with the total of stockpiled cinders on hand usually being in the neighborhood of 10,000-cu. yd. to assure adequate ageing.

Partial view of cinder processing plant foreground and block plant right background

Cinder Processing

Material is reclaimed from the stockpile by a 1-cu. yd. Bay City clamshell and dumped to a 20-cu. yd. hopper. A Haiss bucket loader is also available for this work, as for instance when the pile has receded too far from the hopper to allow the crane to make the transfer in one swing. Cinders are transferred from the hopper to a 24- x 20-in. Jeffrey pulverizer set to 3 in. via an electro-magnetic vibrating grizzly of the same manufacture as the crusher. Fines that fall through the grizzly by-pass the primary and are chuted to a belt that also collects primary crusher discharge. This is a 20-in. belt conveyor on 25-ft. centers. A rectangular Dings electromagnet suspended over the second belt is self-cleaning. All belt conveyors in this plant were manufactured by Barber-Greene Co. Minus 3-in. material is discharged from the second belt into a

Clamshell of 1-cu. yd. capacity used to transfer cinders from ground storage to hopper serving primary crusher

set of 24- x 36-in. rolls, set for $\frac{1}{2}$ in. The material is then elevated by a 24-in. belt conveyor on 40-ft. centers to a 3- x 6-ft. single deck Pioneer vibrating screen fitted with $\frac{5}{8}$-in. screen cloth. A second electromagnet, a round Cutler-Hammer unit, is suspended over the belt serving the screen. Oversize on this screen is returned to the stockpile while throughs fall into a 40-cu. yd. hopper with a Syntron electro-magnetic vibrator attached near the bottom to assure an even flow of cinders from the bottom of the hopper.

Sized cinders are collected on an 18-in. belt conveyor on 230-ft. centers for elevation to four overhead bins in the plant. Cinders are discharged to any one of four 75-cu. yd. bins by an 18-ft. distributor belt. The cinder bins, the 330 bbl. overhead cement storage tank, elevators, screw conveyors and traveling weigh lorry are all of Butler Bin Co. manufacture. The plant has been successful in its use of this system for processing cinders, and Mr. Leece reports that in repeated tests 5 percent is retained on a $\frac{3}{8}$-in. screen, with a fineness modulus regularly obtained of 4.20.

Products Plant Operation

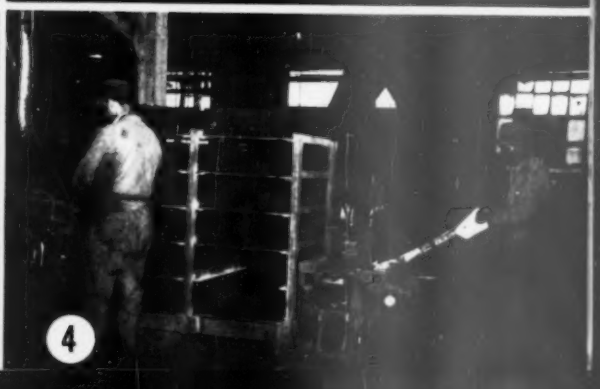
Cinders and cement, proportioned to the traveling weigh lorry, are discharged to any one of three Besser concrete mixers: two of 40-cu. yd. capacity (one devoted to concrete mixes for the specialty department), and one of 50-cu. yd. capacity. An automatic counter and timing device is mounted on each mixer which gives a clear picture of number of batches discharged from each mixer during 24 hr. mixing time, down time and comparative cycles. In addition to the two block machines, the plant also houses a Kent Lintelator and a Flemming machine. Large lintels and architectural forms are cast in a separate room adjacent to the machine room. Three Barret Cravens electric lift trucks transport block from the two machines to the kilns; Clark platform trucks empty the kilns and return empty block racks to the machine room. The company is experimenting with a system of cubing, and is trying out a Service Caster fork truck with side-gripper, air-expanding forks. An Erickson fork truck is used in the plant for changing molds on the machines and for handling lintels.

At the present time there are 13 kilns, each with a capacity of 12 racks of 72 block, but in the immediate future, plans call for expansion which will almost double kiln capacity. Curing cycle, when increased block capacity will permit the company to operate on one shift per day, will be: 1 hr. pre-set; 2 hr. live steam (or until temperature in kiln reaches 180 deg. F.); 20 hr. soak period, at the end of which time kilns will be exhausted by a fan and duct system. Two coal-fired Kewanee boilers with stokers and automatic controls, now in use, will be adequate for the increased kiln capacity. Capacity of enlarged kilns will be 24,000 8-in. block.

In addition to steam curing of modular block, all small specialties are cured in the kilns. These specialties

(Continued on page 220)

No. 1: Minus $\frac{1}{2}$-in. cinders from secondary roll crusher are transferred, lower left, to belt for elevation to vibrating screen. Note electro-magnet suspended over belt, and bucket loader immediately behind. No. 2: Producing thin concrete slabs on semi-automatic machine. No. 3: Removing lintel from forming machine by pneumatic offbearer. No. 4: Electric hand truck that is used to transport loaded block racks to kilns



INTERIOR VIEWS THAT SHOW WHAT IS MEANT BY "SPECIALIZING IN SPECIALTIES"

No. 1: View of general office. Note abundance of light from windows, glass block, skylights and fluorescent lighting fixtures. No. 2: Drafting and layout room, with large window, left, admitting north light. No. 3: Private office of H. J. Vincent, an example of the continuous vertical joint as opposed to random ashlar construction elsewhere in the building. No. 4: Entrance hall of the Cinder Block Inc., side of new office building. Note pre-cast architectural detail at top of wall and also highlights afforded by use of red-clay brick for trim. No. 5: Interior detail of church constructed with cinder block and pre-cast units of cinder concrete. Arches around double doors were cast to architect's specifications. Derrick & Gamber, Inc., were architects for this Grosse Pointe Woods Presbyterian church

Photographs on this page by Ashleford—

Henry Horn (center of picture to left), president of both Cinder Block Inc., and Horn Fuel and Supply Co., flanked by his two sons: Robert, left, and Walter, secretary-treasurer and general manager, respectively, of the block company. Pictured to right, left to right, are H. J. Vincent, sales and promotion manager; A. V. Leece, production manager; and Carl Asmus, a veteran employee of the company

include many shapes, sizes and styles of block (frequently made to architect's specifications), reinforced lintels of all sizes, interior trim such as arches and pre-cast architectural designs. Architectural specialties and large lintels are made in a separate part of the plant building that is fitted with hand vibrators, special molds and other necessary equipment. An 8-in. cinder block weighs 30 lb., and tests over 1000 p.s.i. in 7 days.

Concrete Block and Specialties Combined in Modern Structure

New business and sales office of Cinder Block, Inc., is an outstanding example of modern design coupled with true functionalism in a structure built for the most part with cinder block and pre-cast forms. These pre-cast units run all the way from large reinforced lintels 12 ft. in length to small architectural designs measuring but a few inches. It is in this that the building is a fine example of the versatility of concrete products. In addition to cinder block and pre-cast forms, the building incorporates interesting use of red clay brick. A drafting room is located at the north end of the building and measures 12 x 24 ft. Here all estimating and detail layout for projected structures is handled. Such a department is of prime importance in order to successfully handle specialties, both from the standpoint of a winning bid and from the standpoint of sufficient return on capital investment in plant and machinery.

Radiant Heating

Throughout the building, wrought iron pipe is embedded in concrete floors to furnish radiant heating. The floors are covered with asphalt tile. Interior of the building is finished, for the most part, with plain cinder block laid up in different types of masonry construction in separate offices. Exterior of the block portion of the building is finished with Peerless cement paint.

Two Offices

Divided into two equal parts, the office building houses not only the staff of Cinder Block, Inc., but also the staff of Horn Fuel and Supply Co. Henry Horn, president of the block company, is also president and founder of the company bearing his name. The block operation had its start in 1923 as Detroit Cinder Block and Tile Co., founded by William Piggins. Following a reorganization in 1934, Roy McCandless was named president. Mr. Horn bought the property in 1944.

Personnel

In addition to Mr. Horn, his two sons, Robert and Walter, are also active in company management as secretary-treasurer and general manager respectively. H. J. Vincent, with the firm since 1923, is sales and promotion manager. A. V. Leece, production manager, has been connected with the block company since 1924.

Strength of Large Concrete Pipe

THE INCREASING USE of large reinforced concrete culvert pipe has necessitated laboratory tests by the two recognized A.S.T.M. methods: the three-edge and the sand bearing. At the present time the A.S.T.M. and the Washington State Highway Department specifications give the ratio of the required load carrying capacity by the three-edge as two-thirds of the load required when tested by the sand bearing, regardless of pipe size. The Iowa State College Experiment Station developed this ratio from experiments performed on 30-in. or smaller dia. pipe; subsequently, without further investigation, this ratio was extended to include all sizes.

In August, 1947, the Washington State Highway Department requested the Structural Research Laboratory, Civil Engineering Department, University of Washington, to make actual tests by the two methods on the larger diameter culvert pipes (36-in., 48-in., 60-in., and 72-in. dia.) to determine the validity of the 1.0 to 1.5 ratio for these sizes. These tests indicate that this ratio holds for the 0.01 in. crack loadings for these larger dia., but that for the ultimate loading it fluctuates between 1.0 to 1.5 for the 36-in. dia. and 1.0 to 2.0 for 72-in. dia. pipe (not a linear relationship). The larger pipes are not as rigid as has been surmised; the 72-in. dia. pipe deflected vertically 3 in. and a corresponding amount horizontally, with the largest crack being on the average only 0.06 in. wide. This indicates that the larger pipe located in actual fills deflect sufficiently to enable the passive pressure of the soil on the vertical or horizontal projection of the pipe to give added load carrying capacity.

This information was abstracted from a paper by William R. Mason, Instructor in Civil Engineering, University of Washington, as reprinted by the University of Washington, Engineering Experiment Station, from Proceedings of The 1948 Northwest Conference on Road Building.

N.R.M.C.A. Yearbook

NATIONAL READY MIXED CONCRETE ASSOCIATION has announced publication of its 1949 yearbook which contains a list of association officers and members of the Board of Directors, a list of active and associate members, with addresses, and carries a brief account of the work of the association since its organization over nineteen years ago.

Concrete Roof Construction

PHILIP N. YOUTZ, architect, has developed a method by which a concrete roof of a house can be poured on top of a concrete floor slab and then raised into place with hydraulic jacks, Portsmouth, Ohio, *Times* reports.

Modern Plants For Ready-Mix

By WALTER B. LENHART

General view of Vancouver plant. Shed, to right of enclosed bucket elevator, is to protect trucks discharging bulk cement

PACIFIC BUILDING MATERIALS CO., and its associate, Readymix Concrete Co., Portland, Ore., have three ready-mixed concrete plants, two of them serving the city of Portland, and one serving the city of Vancouver, Wash., a short distance north of Portland and just across the Columbia river. A three-year expansion and re-building program has been completed that involves a very modern and up-to-date sand and gravel plant, and a new ready-mix plant alongside the new gravel producing structure at one of the Portland plants, and a new batching and mixing plant at Vancouver. These two new ready-mix plants replace older structures that were torn down and removed.

Ready-mix Concrete Plant Next to Sand and Gravel Operation

The new plant in Portland is located near the west end of the Ross Island bridge, and is connected to the new sand and gravel plant by a long, inclined belt conveyor that receives its material from a very efficient and flexible series of belt conveyors that enable the operators to blend over a wide range. The new gravel plant was described in the October, 1948, issue of ROCK PRODUCTS and features the use of Dorr Co. sand sizers. This was the first installation of this type of sand classifier in the West and its use makes it possible to prepare at least eight different sizes of sand, should the operators so choose. However, at this operation, only three sizes of the fine aggregate are prepared.

The Curry Street ready-mix plant is built around C. S. Johnson weigh batching equipment using Kron Scales. The mixer at this plant (all concrete is pre-mixed), is company built as are all plant mixers used and are of the screw or non-tilting type with capacity of 3 cu. yd., although 4 cu. yd. can be handled if necessary. The company has a fleet of 56 mixer trucks which range from 3- to 6-cu. yd. capacity. This number includes some company-built agitator units. The standard drum-type truck mixers are Rex, Jaeger and Blaw Knox.

The main structure of the concrete plant consists of five bins for aggregate with a total capacity of 350 tons, with three cement storage bins that have a total capacity of 1400 bbl. One unit holds 1000 bbl. of standard cement and the other two hold 200 bbl. each and are used for high-early strength or other special cements. Water and admixtures are automatically measured and the cement and aggregates weighed. Use of air entraining admixtures in this area is on the increase, this company using Darex, Pozzolith, and Air-trap.

A 6-cu. yd. drum-type truck being loaded with pre-mixed concrete at the Curry St. plant

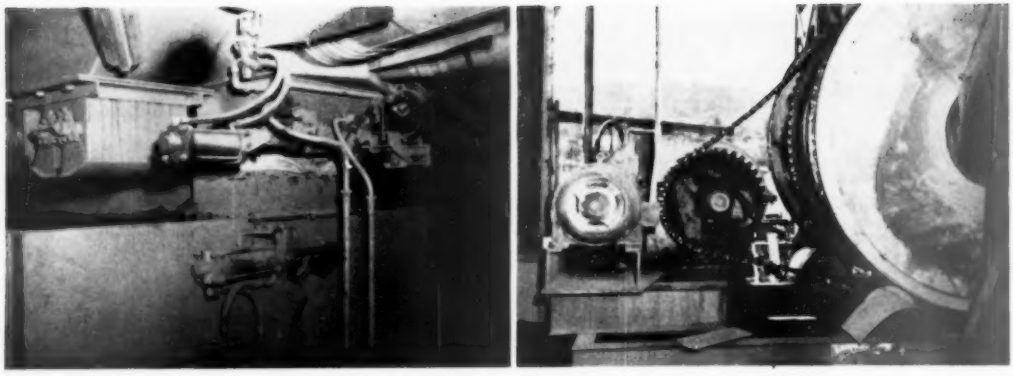
Concrete Mixers

The company-built plant mixers are of heavy design and are mounted as shown in the illustration. The unit here is driven by a 50-hp. Fairbanks, Morse motor through a Joshua Hendy Iron Works gear-reduction unit. The mechanism for handling the two unloading spouts of the mixer are air actuated, with air for the device coming from a small Worthington air compressor. The plant has turned out 740 cu. yd. of material in an 11-hr. day. Actual hourly capacity is 120 cu. yd. On the second floor of the main plant structure a field testing laboratory and office is maintained in easy reach of the gravel plant through an Executone interoffice communications system. Charles Setbin is in charge of the Curry street mixing plant.

The Vancouver, Wash., plant features a Noble 350-ton weigh batcher with automatic weight controls for cement and manual controls for aggregates. The automatic features operate through an electric-eye control mechanism that in turn operates the air ram gates for the cement. The screw conveyor that delivers cement to the weighing hopper has an air ram gate on the outlet end of the conveyor, and the outlet gate on the weighing hopper to the mixer also has an air-operated ram gate. Water is measured by Kron scales.

Aggregates Delivered by Water

Aggregates are delivered to the Vancouver, Wash., plant by scow from the company's two sand and gravel plants on the Willamette river that empties into the Columbia river a short distance below Vancouver, Wash. At the dock side, the aggregates are unloaded by a Lorain "75" clamshell rig. The material is delivered to a separate dry batching plant via a 24-in. belt that is 150 ft. long. The aggregates can by-pass this unit and go on to the higher structure and main mixing plant by a second inclined belt that is 100 ft. long. There are five aggregate bins at the main plant with a capacity of 350 tons, and two bulk



Air-ram gate, left, under aggregate hopper; and motor, gear-reducer, chain-drive for stationary mixer

cement silos of 500 bbl. each. The mixer is a 3-cu. yd. company-made unit. The bucket elevator for the cement can deliver 60 cu. ft. per minute to either silo. A passenger elevator serves the top sections of the plant and is also used to haul the admixtures to the operating floor. Some admixtures are mixed on the ground floor and pumped to two measuring cylinders located on the operating floor. Some Trimix is being used especially where a faster set is desired and Darex is used for air-entrained concrete. Water is measured. A steady head tank for the water is mounted near the top of the main plant and its use has aided in the control of water to the mixer.

The warehouse, truck shop, mixing plants and aggregate hoppers are all painted white, aluminum and yellow.

During the 1948 flood of the Columbia river the plant was shut down for one month but very little damage resulted, for the manager of the operation, Melvin Erland, on receiving word of the on-coming flood waters, moved everything out that could be damaged by water and the warehouse building itself was weighted down with 150 tons of concrete block. Windows and doors were removed and the flood waters allowed to pass through and around the structure.

Operator on batching floor, Curry St. plant

Melvin Erland, manager, Vancouver plant, standing beside two admixture tanks

The company's third and older ready-mix plant, operating in conjunction with the second gravel producing plant, is located at the foot of Morris Street in Portland. The offices of the Readymix Concrete Co. and the Pacific Building Materials Co. are at 400 N. Thompson St. Frank Penepacker is president of Readymix Concrete Co., and Harold Eykelbosch is president of Pacific Building Materials Co.

ROSS SAND AND GRAVEL CO., Concordia, Kan., has started the production of ready-mixed concrete at its sand and gravel plant site.

Determining Concrete Compositions

ANNOUNCEMENT of a publication, "Granulometric Composition of Concrete," by R. Vallette, has been made by *Highway Research Abstracts*. The author claims to have the final answer to the question of the practical determination of concrete compositions. The least possible amount of sand should be used in order to be able to use the least amount of water he states, and argues against continuous grading as giving bad compactness. The grading should be discontinuous, composed of categories of grains of the same size, and rules are given to determine the relative size of each category to insure a better concrete with improved maximum strength and watertightness, and minimum porosity. The author describes the good results obtained by following these rules by the Society of the French National Railroads.

Concrete Pipe News

AMERICAN CONCRETE PIPE ASSOCIATION, Chicago, Ill., recently issued the first copy of its new monthly publication titled *Concrete Pipe News*. It is planned as a promotional tool, and will stress installations of concrete highway culverts, railway culverts, sanitary sewers, storm drains, irrigation pipe, farm drain tile and airport drainage.

The first issue, an 8-page booklet, contains several large job-photograph reproductions together with data and specifications of contracts. A space has been left vacant on the back page for the imprint of the company distributing the brochure locally.

Mailed to members at the same time as the first issue of the brochure was a mimeographed form for reporting project data on concrete pipe installations, together with instructions and information as to the type of photographs desired.

Modern block plant and storage yard of Irions Concrete Block Co., Chillicothe, Ill.

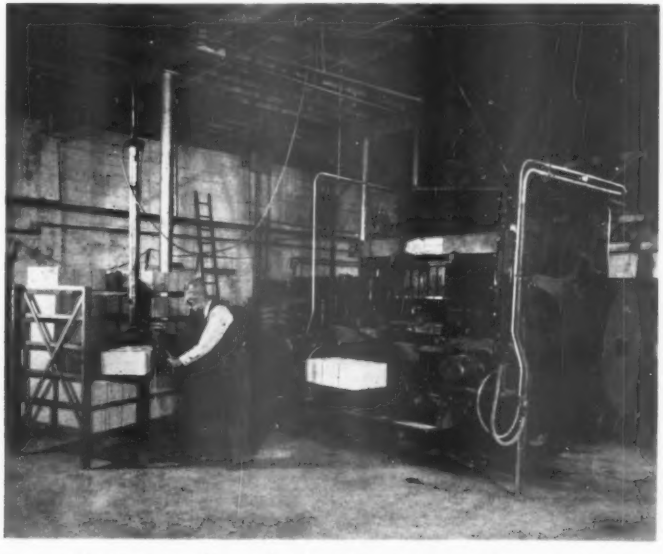
Selling Aggregates As Concrete

Provide aggregate outlets through concrete block and ready-mixed concrete at Chillicothe Gravel Co., Chillicothe, Ill.

By HARRY L. SPOONER

IN 1935, the plant of Chillicothe Gravel Co., Chillicothe, Ill., was operated solely as a washed and graded sand and gravel operation handling approximately 100,000 tons gross output annually. The market for this production consisted of local rural truck trade and the supplying of dealers and contractors.

When Jacob H. Irions was placed in charge of the plant, he at once began planning on extending the scope of operations. He planned to diversify the operation by utilizing a part of the sand and gravel production in the manufacture of finished products, thus making the operation profitable. The new venture would extend the range of business afforded by new lines, and also guarantee additional outlets for the gravel pit operation and make a market for the smaller material from the pit.



Automatic block machine capable of producing 900 modular 8-in. block per hr.

A start in this direction was made in 1938, when a small concrete block plant was established on the premises. This plant had a capacity of 1000 block per day. Block made included 4-, 8-, 10-, and 12-in. modular units. Then, in 1942, a small ready-mixed concrete plant was completed as a part of the operation.

In 1944, Mr. and Mrs. Irions purchased the Chillicothe Gravel Co. By this time the concrete block plant was running at full capacity and it was apparent that the capacity must be increased. As a result, in October, 1945, a site adjoining the gravel pit property was secured and a modern block plant was erected, beginning operations on September 21, 1946.

Modern, High Capacity Ready-Mix Concrete Plant

In April, 1948, Mr. Irions made another advance by purchasing a modern, high capacity ready-mixed concrete plant that had just been completed in Peoria.

At the close of 1948, in order to better administer the various operations, Mr. Irions formed three corporations. The original operation, including the gravel pit and small ready-mixed plant at Chillicothe retained the name of Chillicothe Gravel Co.; the concrete block manufacturing unit was named Irions' Concrete Block Co.; and the Peoria ready-mixed plant was given the new name of Irions' Quality Concrete Co. Mr. Irions maintains an office at the Chillicothe block plant and an executive office in the First National Bank Building, Peoria.

The new concrete block plant is it-

Conveyor elevates aggregate to ready-mixed concrete batch plant. Hopper under middle of conveyor stores seal-coat material

Drum-type mixer-truck being loaded at the Peoria batch plant

self built of concrete block, produced by the original block machine. Operations began with 4-, 6-, 8-, 10-, and 12-in. modular block, both standard and Celocrete light weight. In addition to regular types, all special types are also made. In 1949, Soffit tile block were added to the line.

Aggregates and concrete sand are hauled from the near-by pit by truck and dumped into a hopper below the track level of the Rock Island railway siding which serves the plant. These materials are then elevated by a 100-t.p.h. belt bucket-elevator and discharged into three 212-cu. yd. Butler bins. The material for Celocrete block is delivered by rail and is handled in the same manner.

From the overhead bins, the materials are discharged into a 50-cu. ft. weigh batcher directly below the bins and from here into a Besser mixer, which is below floor level. The cement, which is received at present in sacked form, is stored in the building. It is added to the mixer by the bag. After the materials are mixed, they are discharged into a 50-cu. ft. skip bucket which carries the concrete to the hopper of a Besser Super Vibrapac block machine. In the immediate future bulk cement will be used for which facilities have already been provided. Bulk cement will be handled much the same as other materials, being elevated to a compartment in the four-compartment overhead bin.

Block Manufacture

When the plant was started in 1946, the block machine had a capacity of 600 block per hr. This was later stepped up to 700 block per hr. and just recently was increased again to 900 block per hr. by the installation of Oswalt dual vibration. An air hoist removes block from the machine six at a time. Each block rack has a capacity of 72 block. When full, the racks are transferred to a steam curing room by an LT56 Towmotor fork lift truck.

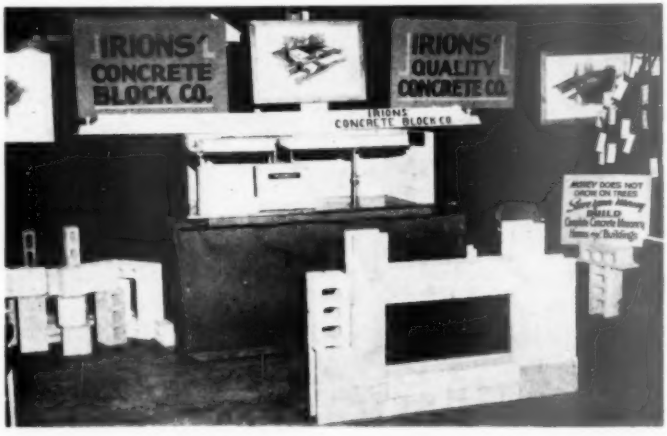
There are five curing rooms, with a total capacity of 8600 8-in. block. The steam is produced by a Cliff-Loline boiler operating with a pressure of 15 lb. The boiler has a 500-lb. stoker which feeds into the rear of the fire box, an arrangement that leaves the front of the boiler unobstructed for cleaning purposes.

Block are cured over night and then transported by lift truck to a Besser stationary yard cuber. The cuber removes the block three at a time from the steel racks and places them in cubes of 72 block each. The 4-in. block are placed on wooden pallets, but all other sizes are cubed directly on the ground. The cubes are then picked up by an LT60 Towmotor fork lift truck and transferred to the storage yard. Block are loaded to trucks by the same lift truck.

The concrete block plant produced about 1,750,000 block in 1948, and is expected to produce 2,000,000 block during 1949 on a one-shift basis. The plant also operates during the winter and so usually has an inventory of about 350,000 block on hand. This year the demand has been much greater than the current production so the inventory has been very much reduced. "One good thing," says Mr. Irions, "is that we do not have to depend upon other producers for our aggregates."

The Peoria ready-mixed concrete plant is located about 50 ft. below the level of the Rock Island railway, which serves it. The gravel and sand used is hauled by truck from the Chillicothe plant. Trucks back up a ramp and dump into a hopper which discharges to an Atlas belt conveyor. The conveyor elevates it to a 212-cu. yd. four-compartment overhead bin. Two of these compartments are used for storage of different sizes of gravel,

(Continued on page226)



Displays such as this at home shows have proven very good investments from the standpoint of obtaining new business

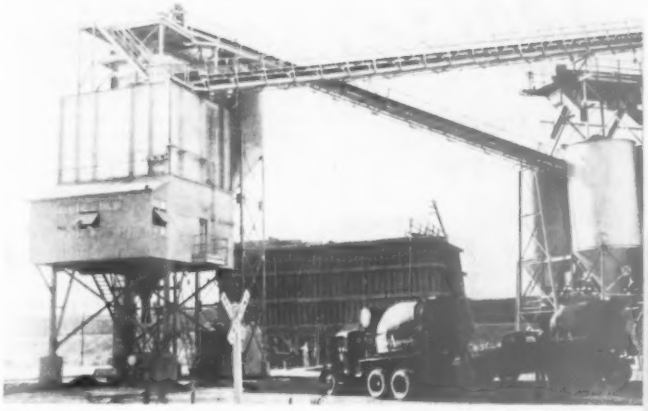
Produce Ready-Mixed Concrete At Aggregates Distribution Plant

THE Sacramento, Calif., distribution yard and ready-mixed concrete plant of Pacific Coast Aggregates, Inc., even though built several years ago, is one of the neatest and cleanest in the industry, and what is more important, it is kept in first class operating condition by its owners. This, in itself, ranks the operation among the best of its kind in the United States.

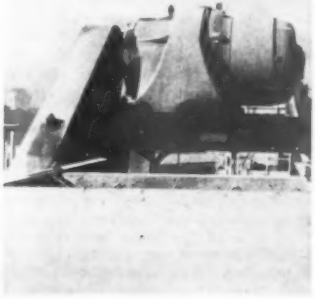
The city of Sacramento, besides being the capital of California, is a distribution and wholesale center for a large portion of the Sacramento and San Joaquin river valleys. Much of the business relating to the metal mines to the east of Sacramento funnel through the capital, and tourist travel through the city is possibly as large as that in Los Angeles. These resources all help to make this an active and growing community.

The yard and batching plant replace an older one at the same site and are located in the west portion of the city in the industrial area and on the Southern Pacific rails. Here the company maintains a district office, has a large warehouse from which many items used in construction work are sold, and has modern sand and gravel and ready-mixed concrete distribution facilities.

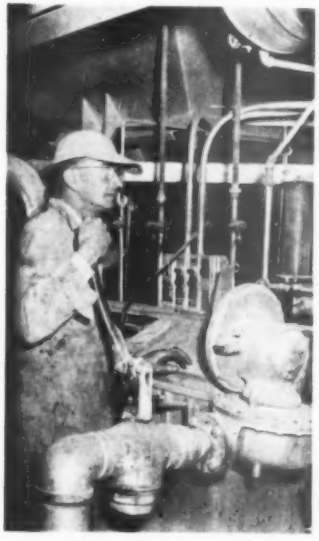
The plant features aggregate unloading equipment for both rail and truck service. The aggregates all come from the company's Fair Oaks plant which is about 15 miles east of the city, on the American river. Belt conveyors are used entirely for aggregates, and a bucket elevator is employed for truck-delivered, bulk cement.



Batching plant, left, is served with aggregate belt conveyor from track hopper to right. To right are truck hoppers for live storage of sand and gravel. Old structure, center, is to be demolished



Motor drive that elevates materials from track hopper to overhead bins by 24-in. belt conveyor



Verne King at the control panel of the batching plant

Rail cars are shifted at the unloading point by a two-drum electric tugger. Four snatch blocks are used for the cable assembly. The distribution plant for sand and gravel consists of 12 conical-bottomed, steel silos arranged in two parallel rows. Each silo holds 120 tons of material. The two rows of silos are far enough apart so that two belt conveyors can operate between them, paralleling the long axis of the two groups of silos. The purpose of the two belts is to reclaim materials for the ready-mix plant that is alongside the distribution assembly, or to transfer material from one silo to another.

Belt Conveyors

The plant has five belt conveyors, all of which were supplied by Conveyor Co., Los Angeles, and 24-in. American Rubber Co. belts are used. The first belt conveyor in the series takes the material from the track hopper and delivers it to a long, inclined belt that goes directly to the top of the ready-mix plant. Here the material can fall to bins over the weigh-batcher, or return, via a slightly inclined conveyor belt over the twelve silos. There the material falls to a shuttle belt serving the bins. The operator on the shuttle floor over the main bins controls the flow of material to the bins over the batcher by means of a remote control, swivelled spout.

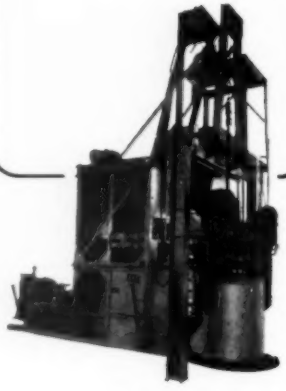
Between and below the bins is a reclaiming conveyor that delivers to the head end of the second belt above mentioned. The conveyors are all hooked up through a Square "D," foolproof sequence hook-up. The entire plant is of steel construction and most of the yard about the plant is paved.

At the batching plant, three sizes of aggregate and one of sand are stored in bins over the weigh batcher. There are two 500-bbl. (each) silos

yes, you can

Buy or Lease

this Universal Concrete Pipe Machine



★ You needn't lay out the purchase price to begin enjoying the production and profits of this great machine. Leasing arrangements are possible on terms that assure profitable operation. The Universal Pipe Machine has set new higher standards for efficiency. It makes more pipe and better pipe with fewer man hours. Because it true-tamps at the incredible rate of 680 strokes-a-minute, you use a drier mix, get stronger pipe that handles with less damage, requires minimum curing. One of the four sizes (5"-24", 6"-48", 12"-60", 24"-72") will meet your requirements. Ask about the *Universal Lease Plan.*

UNIVERSAL CONCRETE MACHINERY CO.
297 South High Street Columbus, Ohio

for portland cement. At the time of inspection the cement was coming from the Permanente Cement Co. and Calaveras Cement Co.

Batching equipment was originally supplied by Conveyor Co. of Los Angeles and uses an electric eye, automatic cement weighing device developed by that company. This equipment is now sold exclusively by the Blaw-Knox Co. which has acquired patent rights. Cement inventories are checked each day and it has been found that the electric scales are very accurate. The cement is weighed in a separate scale hopper that is near the center of the scale assembly. It is held that the portland cement, when dumped to the trucking equipment, is better mixed when the center dump system is used. The aggregate hopper holds 5 cu. yd.

Haulage Equipment

The company has a large fleet of haulage equipment at its many plants in the West and has assigned 13 units to the Sacramento plant. These are all 5-cu. yd. units, featuring Smith mixers mounted on Mack and International trucks.

The Sacramento division of the Pacific Coast Aggregates, Inc., is under the management of A. J. Wilson. J. J. Penrose is sales manager and Merrill Joslin is yard superintendent. Main offices of the company are in San Francisco.

Expansion

(Continued from page 224)

one for concrete sand and one for cement. Cement is received in bulk in covered hopper cars which discharge to a screw conveyor below the track bed. The screw conveyor discharges into a bucket elevator, which, in turn, discharges into the overhead bin. The cement compartment of the bin has two divisions, each of which holds 200 bbl.

The overhead bin tapers off, with four outlets directly above a 5-cu. yd. weigh batcher with beam scale. Water is weighed at the same time in a water weigh batcher by a separate scale which converts pounds into gallons. A 2-in. city water line feeds the water batcher so no pumping of water is required. The aggregates, cement and water are dumped directly into transit-mix trucks.

Below the aggregate conveyor is a bin for storing Sealcoat gravel, which is sold to road contractors. This bin discharges directly into trucks. The plant set-up allows for hauling 500 cu. yd. per 8 hr. day.

Transit-Mix Equipment

The company maintains 14 transit-mix trucks in all, 11 at the Peoria plant and 3 at the Chillicothe plant. Twelve of these are Jaeger's and two are Smith's. Although the transit mixers are assigned to their respective plants, they are shifted as needed to reach jobs with the greatest convenience. "Because of having two ready-mixed plants we are in an enviable position to serve our customers from the nearest plant. We operate the largest fleet of transit mixers of any concern in the Peoria area," states Mr. Irions.

The company does not maintain a fleet of trucks for delivery of gravel or concrete, but rather a local cartage concern does this work under contract.

One thing that has allowed Mr. Irions to keep expanding his production is a well-balanced promotional program. Prominent in this is newspaper advertising. Display ads are used once a week in the Peoria daily papers and in every issue of the weekly "Peoria News," "Labor Temple News" and "Masonic News." Radio spot announcements are used once a day, seven days per week.

Direct mail is extensively employed. One of the pieces used for this is a very attractive two-color, four-page price list of concrete block. This is well illustrated, showing the shape and giving the sizes of 26 different block and listing 31 different types, with prices. The front cover shows a picture of the plant and the back cover gives methods of concrete block construction. Circulars are also mailed to concrete contractors.

Merchandising

Mr. Irions subscribes to the Dodge reports and follows up the information given therein of any new building projects in the area where there is an opportunity of interesting builders in concrete block or in ready-mixed concrete.

Two salesmen are employed to cover outside wholesale outlets for sand, gravel and concrete block, such as lumber yards and other dealers. About 70 dealers within a radius of 80 miles handle Irions' products.

Ready-mixed concrete is sold direct within a radius of 25 miles from each plant. Within the past few years, a considerable business in ready-mixed concrete has been developed with farmers for the construction of feed lots and daily barn floors. The transit mixers make good traveling billboards to advertise the company's products. They are all painted white and present a pleasing appearance.

Displays at home shows have proven very good investments from the standpoint of new business leads. It is surprising what attractive displays can be made with such objects as concrete block and other concrete products. All names of prospective customers, from whatever source received, are followed up by personal contacts and phone calls and an effort is made to sell the prospects, whether dealer, contractor or individual. At present the Chillicothe office is located in the Irions residence adjacent to the block plant property. However, a new office and warehouse building and a three-stall garage are now in process of construction, all from concrete block.

These will utilize Soffit blocks and radiant heat in the ceiling.

"We have found," says Mr. Irions, "that our contention that finished products pay better than simply furnishing raw materials is correct. We stepped up the production of gravel and sand by 50 percent last year, with a total of 150,000 ton. Of this production, we used 50,000 ton in our ready-mixed concrete plants and 35,000 tons in our block plant. We expect to keep on increasing our production of block and built our block plant with this in view, allowing plenty of room to add another machine when necessary."

Washington Masonry Producers Meet

THE CONCRETE PRODUCTS ASSOCIATION OF WASHINGTON held its twentieth annual summer meeting June 17-19 in Winthrop. Business sessions were held the second day at which time it was decided to enlarge the organization to include associate, contributing and honorary, as well as regular memberships. The Research committee on pipe gave a progress report on the irrigation pipe investigation being carried on at the state college; the research committee on concrete block presented a report on the pumice investigation being carried on at Washington State college; and reports and recommendations were presented by the standards committee on pipe and masonry. A special report was presented by the safety committee. A safety consultant has been engaged and reports and records are being made available for study by the consultant.

H. A. Parker, supervising engineer, Columbia Basin Project, Bureau of Reclamation, Ephrata, Wash., presented a paper on "Concrete and Concrete Pipe on the Columbia Basin Project," showing slides of the various construction jobs over the project. In a question and answer period following, the rate of land development, canal extensions, land use and water use, were discussed to show the activities planned for the project.

Carl A. Menzel, manager, housing and cement products bureau, Portland Cement Association, Chicago, discussed "Research and Promotion of Concrete Masonry." Mr. Menzel has been conducting investigational study and experimental work in connection with concrete masonry with the various types of lightweight and natural aggregates now in common use over the United States. In a second question and answer period, problems of the local manufacturers were discussed.

The following officers were elected: president, A. B. Metcalf, Columbia Concrete Pipe Co., Wenatchee; vice-president, H. C. Lutes, Layrite Concrete Products, Spokane; secretary, F. M. Kettenring, Graystone Concrete Products Co., Seattle; treasurer, Talbot Campbell, Seattle Concrete Pipe Co., Seattle; and directors, George P. Duecy, Associated Sand & Gravel Co., Everett, Charles Delling, Puyallup Shope Brick Co., Puyallup, and B. E. Harrison, Harrison Pipe Co., Tacoma.

Money-Saving Research

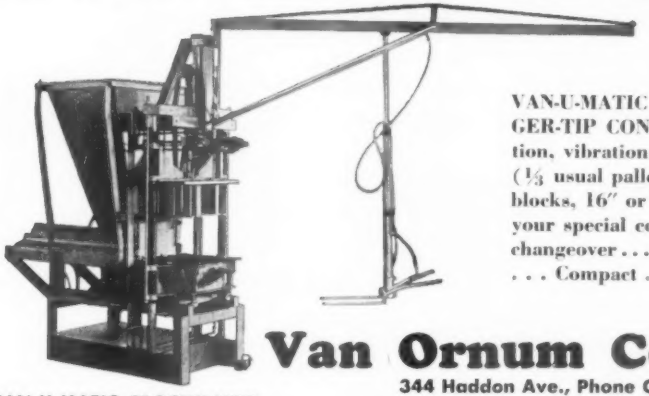
RESEARCH conducted in the Bureau of Reclamation's concrete laboratory at Denver, Colo., will pay off in a saving of $4,750,000 at Hungry Horse Dam, the world's fourth largest, now being built in northwestern Montana, *Engineering News-Record* reports. The Boise, Idaho, regional office gave an account of the money-saving techniques used, most important of which is the Bureau's first major use of pozzolan.

Pre-Cast Concrete House

VICENTE CORDERO MANERO, Rio Amur, México, D. F., has patented a system for constructing a pre-cast concrete house. These houses are made of rectangular sections which may be joined together in many combinations and set on concrete pipe columns as a foundation. The inventor states that component parts for these small inexpensive homes could be manufactured in many concrete product plants with little or no additional equipment.

Different... Sensational... WORK THE FIRST DAY AND THEREAFTER

$4300.00! HOW CAN SO LITTLE MONEY BUY SO MUCH! 400 BLOCKS PER HOUR



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...with the Greatest Ease
Anytime...Anywhere

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1949 CLIPPER MASONRY SAWS

Yes, nine NEW models to choose from and each with outstanding features for smooth, fast and economical Clipper Cutting Action. See the 1949 DUSTLESS Model HD—cuts wet or dry—the 100% Answer to All Masonry Cutting. Contact your nearest Clipper Factory Branch for a FREE TRIAL on any of the nine Clipper models. See the "ADJUST-A-CUT" Control, "PRESSURE EQUALIZER" Spring, and the STREAMLINED Conveyor Cart . . . you'll know why Clipper is more outstanding than ever before!

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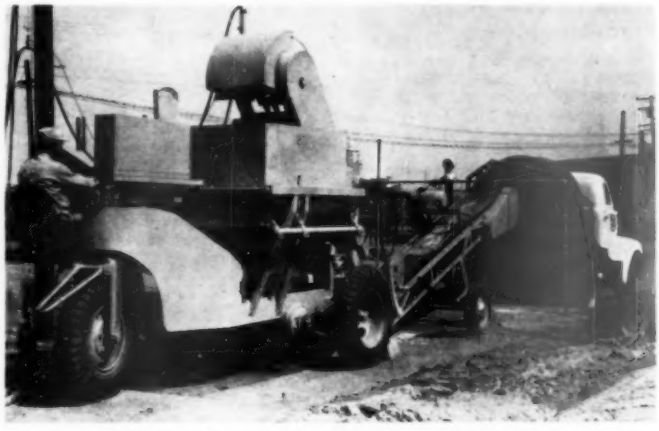
Fleet of transit mixers being used by the Valley Cement Co., Yakima, Wash.



Two-cu. yd. self-loading weigh batcher and mobile conveyor deliver concrete to mixer drum

Transit Mixers

WILLARD CONCRETE MACHINERY CO., LTD., Lynwood, Calif., is in production of transit mixers and supplementary mobile equipment. The complete Willard "mobile system" comprises a 3-cu. yd. transit mixer, a mobile weigh-batcher, and a mobile conveyor that loads the mixer from the weigh-batcher, which equipment eliminates the need for overhead bunkers. Such a system was installed recently at the Valley Cement Co., Yakima, Wash.

Features of the mixer, listed by the company, are a rear throttle control that regulates speed of the mixer from the outside as well as inside the driver's seat; a clutch shift lever that reverses the direction of the mixer to discharge; no heavy door, hatch or "gate" for charging or discharging through design of the mixing blades; and compact size. The mixer body is no wider than the truck on which it is mounted.

The weigh batcher picks aggregate up off the ground with a chain

JOIN 11,895 PRODUCERS WHO REGULARLY READ ROCK PRODUCTS

Color in Concrete

The easily dispersible, non-floating, permanent, qualities of these extra strong colors produce intense shades in concrete.

Special blends in ton lots at no additional charge. Working samples furnished.

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MINERAL PIGMENTS CORP., MUIRKIRK, MD.

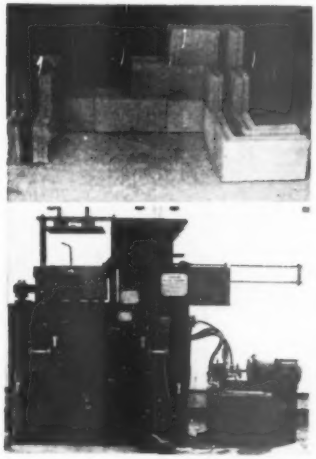
bucket elevator, weighing the batch on a 3-beam, boxed-in standard scale. The conveyor, which takes the batch from the weigh batcher and delivers it to the mixer drum, is entirely mobile, allowing it to be used in the yard as well as on the job.

Lift Truck Handles Palletized Loads

SALSBURY CORP., Los Angeles, Calif., has added the "Palletruk" to its line of materials handling trucks. The new unit is equipped with two 9-in. forks, 48 in. long, spaced 9 in. apart, with tapered forward ends for ease in picking up many types of pallets. A 4-in. lift is provided for clearance above the floor. The truck is said to negotiate aisles slightly wider than the pallet being handled and turns in its own length. Loads up to 4000 lb. can be handled.

Continuous Cavity Block

BURKARD BLOCKS, INC., Waverly, N. Y., has perfected a semi-automatic, hydraulically operated block machine for producing the Burkard Concrete Clapboard Building Block. This block is made with an inside and outside shell that are tied together by steel rods embedded in the concrete. The face of the outside shell has a ½-in. bevel which produces the appearance of 8-in. clapboard siding. These block are obtainable in the modular 8-in. size, as well as half block, inside and out-



Top: Burkard continuous cavity block. Bottom: Newly developed machine that manufactures shells for block pictured above

side right and left hand corner block. All styles maintain the same 2½-in. continuous cavity. The block are also tongue and grooved, top and bottom, to assure correct alignment.

HYTINEN CONCRETE CO., Seaside, Ore., has started construction of a ready-mixed concrete plant in North Crescent City. William Hytinen is president of the firm.

LIGHT WEIGHT • SOUND PROOF • INSULATING

uniform pumice graded

FIRE PROOF • NAILABLE • SAWABLE

ANOTHER EXAMPLE of Pumice Concrete Construction

Compressive Strength 2500 psi Weight 75 lbs. Per Cubic Foot

Lightweight concrete, properly designed with uniform graded pumice aggregate offers many structural advantages and actual construction savings that are worth careful consideration by architects and engineers. At Altus, Oklahoma, for example, the dead load of the structural frame for this monolithic hospital building was reduced approximately 50% by the use of pumice concrete. A saving of 45% in reinforcing steel with the same live load capacity was accomplished. In addition to these advantages, usable space efficiency was improved materially due to a smaller supporting frame made possible by the lighter load.

Plus Value!

THERMAL INSULATION

Taking full advantage of the insulating value in pumice, the designers of the Altus hospital used 8" roof and floor slabs with an insulating value approximately equal to a normal 6" slab of ordinary heavy concrete PLUS 3" of insulating material.

Plus Value!

ACOUSTIC INSULATION

Where acoustic properties are desirable, the walls of this material are finished with a rough texture, the resulting high percentage of sound absorption achieves a quietness that adds materially to the comfort of occupancy. This characteristic is especially noticeable in masonry walls and partitions.

Plus Value!

LOW SOUND TRANSMISSION

Average transmission losses of 53 decibels have been ascertained for this material. This low transmission factor greatly reduces the chance of noise in one room disturbing the quiet in other rooms.

PUMICE PRODUCERS ASSOCIATION

715 FIRST NATIONAL BANK BLDG. • ALBUQUERQUE, NEW MEXICO

UNIFORM GRADED PUMICE is a name applied only to pumice aggregate produced by members of the Pumice Producers Association. Write your nearest producer for technical data. Additional information is in your 1949 Sweet's Architectural (4E/S) and Engineering (4A/8) files.

THE EMBLEM of the Pumice Producers Association stands for Quality Pumice suitable for aggregate in the production of lightweight concrete for structural purposes. It is for your protection; only members of the Association and their franchised manufacturers are permitted to display it.

It's Bigger than Your Block Market!

F & A Floor and Roof System For Building Construction

Means

Volume Business

Because . . .

ECONOMICAL — Practically a dry system requiring only semi-skilled labor for installation and no forming.

SPEEDY ERECTION — provides an immediate working deck for other trades.

FLEXIBILITY of installation of all services — electric, plumbing, heating, etc.

REDUCES DEAD WEIGHT with the hollow block.

DEVELOPS T-BEAM ACTION in the joists.

FIREPROOF — withstands standard 4-hour fire and water test.

WIDE LATITUDE IN DESIGN for any necessary superimposed load.

INSULATING PROPERTIES against heat transfer.

ADAPTABLE to any specified finish — both floor and ceiling.

Seven concrete products plants now producing F & A System Products in the Southeast are operating at *full capacity* to meet demand.

SCOPE OF SYSTEM

F & A Roof and Floor System, an entirely new development in pre-fabricated building construction, uses a combination of inverted T-joists and filler blocks of pre-cast-concrete, and a poured-in-place top slab.

RESEARCH DEVELOPMENT

It was perfected through years of research by F & A Laboratories, Inc., Greensboro, N. C., jointly organized by these leaders in the Concrete Products Industry:

Otto and Paul Formigli, Formigli Brothers, Inc., Phila. Penna. M. A. Arnold, Arnold Stone Co., Greensboro, N. C. J. W. Warren, Sr., Southern Cast Stone Co., Knoxville, Tenn.

BIG POTENTIAL MARKET

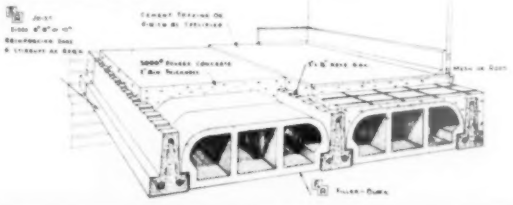
Initial acceptance already indicates a potential demand far bigger than the market for concrete block.

EASILY ADAPTED

Any concrete products plant equipped with standard high-production, plain-pallet, 3-block equipment can get into production quickly. The only special equipment required is (1) F & A Mold Box Attachment for filler blocks, (2) F & A Joist Forms and Multiple Vibrating Cradles for joists.

ACCEPTED AND PROVEN

Leading architects who have examined the F & A System are enthusiastic over its possibilities. They are already writing it into their specifications where F & A Products are available.



Exclusive Territorial Rights which include Sales and Engineering Consultation are now available to merchandising-minded concrete products producers. Acceptance of future developments of F & A Laboratories, Inc., are optional.

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ROY DARDEN INDUSTRIES, Inc.

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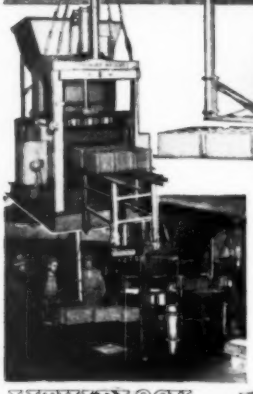
OVER 7,000 BLOCK Per Day AUTOMATICALLY PRODUCED

FOR LESS Than 1¼¢ Per Block LABOR COSTS



Mr. Howard E. Johnston of the Franklin Concrete, Inc., of Franklin, Tenn., recently wrote us an enthusiastic letter.

Excerpts of this letter are as follows:

"The past week we produced 39,038 8" x 8" x 16" units in 5½ days one shift, or over 7000 per day. Our labor cost was .0121 cents per block."

"We feel our greatest gain is 100% improvement in our product."

If you are interested in similar production records we invite you to write us at once for full details—others have profited greatly through just a post card.

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NEW, WATER-REPELLENT BRUSH COAT SEALS PORES OF CONCRETE AND BEAUTIFIES IN ONLY ONE COAT!

- For exterior or interior use on cinder blocks, light-weight aggregate and concrete blocks.
- Better than two or more coats of ordinary cement coatings.
- Fills all voids. No hair checking. No alligator checking. No powdering.
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KENT MIXER

The original Kent continuous mixer with reciprocating feed plate. Thousands in use. Still in demand as a popular priced unit.

The KENT Stediflo—with endless belt feeding mechanism of aggregate, screw feeding of cement, anti-friction bearings and other advanced features. Capacity up to 10,000 Grade A blocks per day.

performance proved by the pioneers

FLOWMASTER—the latest KENT mixer. Embodies all the advanced features of the Stediflo in a mixer for small and medium plants. It's fully automatic—set it—start it—leave it.

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The KENT MACHINE COMPANY

CONCRETE PRODUCTS MACHINERY

Cuyahoga Falls, Ohio

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STRONG, durable and weathertight walls are the product of six important essentials—proper planning and design, adequate footings, quality block laid with good mortar, the use of concrete sills and lintels and *quality workmanship.*

Quality workmanship means laying each unit plumb and true, using full face shell bedding and compacting the mortar when it has partially hardened.

Such craftsmanship is the builder's best assurance for a prosperous future. It builds a quality reputation through satisfied customers, and that, in turn, stimulates more construction and more jobs. Write for free, illustrated literature, distributed only in the U. S. and Canada.

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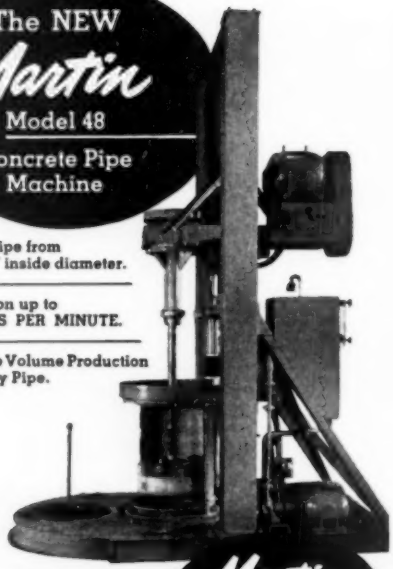
A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

The NEW
Martin
Model 48
Concrete Pipe Machine



Makes pipe from 4" to 24" inside diameter.

Production up to 2 JOINTS PER MINUTE.

For Large Volume Production of Quality Pipe.

Backed by more than 40 years experience in the manufacture of concrete pipe equipment and irrigation gates and valves.

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TRUCK MIXER

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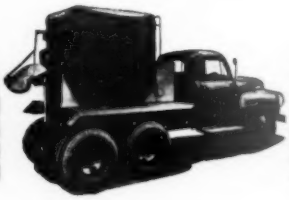

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REVOLUTIONARY TRUCK MIXER DESIGN
THE RESULT OF 18 YEARS OF TRUCK MIXER MANUFACTURING and 25 YEARS OF CONCRETE MIXING EXPERIENCE

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5 Ericksons
Now Owned by Gage Bros.

We quote from a letter to us by Gage Bros. Concrete Products Co., Inc., Sioux Falls and Aberdeen, S. D. "After coming back from our Aberdeen plant I can't say enough good about our two new Erickson high-lift trucks, making five we have purchased. For maneuverability, sturdiness and performance over almost any type of yard I don't see how anyone can afford to be without one in a concrete block plant. Everything is in a neat pile, we save a lot of yard space and much confusion. Inventories are a snap to take now, all we do is check the number of cubes."

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FOR YOUR SPECIALS
Make 'em Yourself—Concrete Blocks

AMAZING GENERAL SPECIALTY BLOCK MACHINE
CAPACITY 1000 BLOCKS PER DAY
Only $199 LESS MOTOR F.O.B. PLANT
SHIPPING WEIGHT 400 lbs.

SPECIALTY BLOCK IN BIG DEMAND. SELL ALL YOU PRODUCE TO BUILDING SUPPLY YARDS, CONTRACTORS AND OTHER BLOCK PLANTS AT 25c TO 50c each . . . 100% MORE PROFITS.

General Block Machine with wonderful new split type expansion Mold Box makes it easy to produce different design blocks. Changes to any width block from 4" to 16" in less than 20 minutes. A real money saver. The General more than pays for itself by saving your labor costs and last production in the time it takes to make three changeovers on your regular machine. Machine ruggedly constructed. Vibrator Shaft mounted in sealed ballbearings, produces up to 1000 8x8x16 blocks per 8-hr. day. Superior three Core Type meeting all building Code requirements. Full Operating Instructions and Mixing Formula's with each machine. Immediate Delivery, Full Details sent Free without obligation.

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It's a Partition Block Machine.

It's a Bull Nose Block Machine.

It's a Foundation Block Machine.
Also Makes Regular ½, ¾, ¼ Sash, Corner, Pier Blocks

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Wonderful book written and illustrated by our staff of experts.

Shows you 8 ways to save money and how to make and lay blocks, laying out building lines, mixing your own concrete, building steps, porches and concrete floors, includes floor plans for 6 beautiful easy to construct concrete block bungalows. Mail at once with $1.

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(Less Chassis)

PROMPT DELIVERY

10—JAEGER 4 YARD

Separate Engine Drive

200 gal. Water Tank

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$2,200.00 each F.O.B. Cars

Excellent Working Condition
May be inspected at:

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FOR SALE

PACKERHEAD PIPE MACHINES. Two Dixons make 4" to 10" pipe. One McCracken makes 4" to 24" pipe. All with or without equipment.

UNIVERSAL CONCRETE MACHINERY CO.
297 S. High St. Columbus, Ohio

FOR SALE

New Hopper type Bin, designed for Bulk Cement, 150 cu. ft. capacity, suitable for storage of other bulk aggregates. Address Inquiries to

ALGER E. WOOD ENTERPRISES, INC.
3619 Wheeler Rd. Bay City, Mich.

FOR SALE

New Barrett Lift truck, special for concrete blocks with sorting frame, rubber tires. $280.00
Dayton 12 ft. air compressor with motor and all accessories.
Multiplex chimney block machine 16x20 and 16x16 almost new.
8"—45% steel pallets and 6" cast iron pallets.
Write

JOHN F. STEINER, Agent
1116 East 28th Erie, Pa.

FOR SALE — BARGAIN PRICE

Almost new J-C 6-pocket Brick Press, complete, motor, starter. 12 cu. ft. Jay Bee batch mixer, complete, motor, starter. Almost new Erickson special high lift truck, 2½ ton capacity. Two 35' C-C bucket elevators, complete, motor, starter. 200 wooden brick platforms. Can be seen in operation. Will sell complete outfit for $5000.00.

STOKESLAND BRICK & LUMBER CO.,
Rt. 1, Danville, Va.

UNBREAKABLE PALLET RINGS
Write for full information
TEXAS FOUNDRIES
LUFKIN, TEXAS

FOR SALE

One 600 cubic yard capacity, 8 compartments; 34 ft. Hex shaped mounted on 14" H-Beam, 67 ft. long; Batching Equipment, Water Batcher; Collectors, two, 2 yard Smith Mixer, Cement Elevator, about 300 ft. 24" Sand Conveyor with under truck feed conveyor; Hot water equipment, Air compressors, Heating Plant, Office Equipment. A plant built about two years ago and on account of its location was condemned and only was in operation about a month. Sold on Court Order. The plant is complete and is for sale at less than one half of the cost. If you are contemplating building a ready mix plant it will pay you well to come and see this before buying.

HASS WHOLESALE, INC.
3922 W. Sample St., South Bend 21, Ind.
Telephone—3-9407

FOR SALE
GOOD USED EQUIPMENT

1 Pallet oiler or dunker	$40.00
1 20' roller conveyor	95.00
1 Hand lift truck	27.50
1 Face-Down Block Machine	95.00
1 Stearns No. 7 mold box	95.00
1 Stearns 8" split core	7.50
1 Stearns 12" split core	8.50
1 Stearns feed drawer	9.50
1 Portable over-head hopper	95.00
1 4" drain tile casing	5.00
1 6" drain tile casing	5.00
1 8" drain tile casing	5.00
1 2 H.P. Westinghouse motor	20.00
1 Cesspool Block Machine	95.00
1 Forked hand off-bearer	55.00
30 Steel block racks	each 5.00

WILLIAM M. CHASE (Dealer)
15 Linwood Ave. Buffalo 2, N. Y.

FOR SALE

Three unit, plain pallet block machine. Purchased and installed new in August 1948. Used about three months. This is a Scripps-Pearson machine with all the electric controls, hydraulic pump, fork off bearer. Should be seen in operation. Also 20 ft. portable 18 inch cupped belt conveyor. Wood pallets. Send inquiries to Box H-78, Concrete Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FOR SALE

6-inch curved mold box for Stearns Clipper Stripper. New. $100.00 f.o.b. Frederick, Md.

RICHARD F. KLINE
14 Water St., Frederick, Md., Ph. 550

1 Jackson & Church Brick Machine complete with press, feeder, and agitator, each individually motor driven. Machine in first class condition, has made only 500 thousand brick.
1 Hunt 14 cu. ft. mixer with electric motor, or without motor.

N. C. PRODUCTS, INC.
P. O. Box 1996 Raleigh, N. C.

FOR SALE

International model KBR-11 trucks suitable for mixer mounting. Also several dumps.

BERMAN SALES CO.
R.D. No. 1 Pennsburg, Pa.
Phone Pennsburg 521

FOR SALE

1—Besser Victory Vibrapac Plain Stripper, Fully Automatic. All motors, starters and switches to operate at a speed of 4 cycles per minute, including extension offbearing conveyor. Also air operated offbearing hoist with finger grips.

1—Attachment to make 7⅝x7⅝x15⅝, 3 core units, one at a time, including parts to make plain ends, halves and steel sash jamb units. Also set of vibrator shafts.

1—Attachment to make 3⅝x7⅝x15⅝" partition units, two at a time, including set of vibrating shafts.

1—25' Besser batch mixer, roller bearing type equipped with 15 h.p. motor and starters and switches. Drum grid, gear housing and extension hopper for mixer at 3' below floor level.

1—25" Besser skip loader with magnetic reversing starter, limit switch and push button.

3000—Plain steel pallets, 13x18½x5/16".

3900—Plain Steel pallets, 5/16"x9"x18½".

61—Model 45 block racks to hold 45—13" wide pallets.

Parts to change over Victory Vibrapac from 9" pallet arrangement to use 13" pallets.

CROWE-GULDE CEMENT COMPANY
Amarillo, Texas

FOR SALE

1—12 cu. ft. Blatt mixer with 7½ H.P. 220-440 3 phase motor.

1—Conveyor with 12" belt and 1 H.P. motor.

1—Blatt single unit block machine—1 H.P. motor.

1—Feed Hopper for above machine.

1—Automatic water control tank.

1000—8x16 Aluminum pallets—40% air space.

All of this machinery is in good condition. Will sell complete outfit for $1500.00

FORT BLOCK CO.
Arthur Flitcroft
R. D. No. 3 Ft. Atkinson, Wis.

FOR SALE

One Flamm No. 1—Block Machine, 1 sk. mixer—Pallets, mixer—ship., etc.

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147 10th Ave. Upland, Calif.
Phone 314-155

1—Kirkham Vibrator Machine with motor
1—12 ft. Mixer with 5 H.P. motor.
1—20 ft. Conveyor with motor.
4"-6"-8" Mold Boxes.
1200—Pallets (all work with any of the above molds).
Price $1000.00 or best offer.

BLACKSTONE MFG. & SUPPLY CO.
P.O. Box 272 Phone 379W
Blackstone, Virginia

FOR SALE

1—Stearns 28 cu. ft. mixer, 20 H.P. elec. motor, V belt drive, clutch. Mixer in use only 20 months. Condition like new as we have installed 4 new bearings, blades and liners since we discontinued using this mixer, real bargain at $1450.00.

1—Stearns yard hoist, never used, will accept any reasonable offer.

ALLCO CONCRETE PRODUCTS CO.
Center Moriches, L.I., N. Y.

ALSO SEE CLASSIFIED ADVERTISING ON OTHER EQUIPMENT IN ROCK PRODUCTS' GENERAL SECTION

FOR SALE

3 Ready-Mix trucks, capacity 5 cubic yards, International KR11 extra heavy duty chassis with DUMPCRETE bodies. Tires 11x20. These trucks were used less than 1 year and are like new. Reason for selling, our Ready-Mixed division is discontinued.

Also offer 80 ft. cement elevator, 60 ft. cement screw, 500-ft. pre-war rubber belt 36" wide, 36" Timken bearing idlers, 300 yard aggregate bin.

Also 7 semi-trailers, platform 8'x26', 11:00x20 tires, with sides for 23 yards capacity.

BUILDERS COMPANY
Madison, Wis. Phone G-5805

One complete Ready Mix Plant New 1946—53 yd. aggregate and 18 yd. bulk cement overhead storage. Completely automatic—hi-low bindicators on cement storage tank of 1600 sack capacity. 2 cu. yd. B.W.C. weighing aggremeter. Other misc. material and equipment.

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Bartlesville, Okla.

FOR SALE

Besser "VICTORY" Vibrapac

Including attachments for 4", 8" and 12" block and brick. (The 8" attachment includes all the bullnose blocks and the 8" long beam lintel block. The 4" attachment includes solid slabs.)

1—25 cubic foot Besser Mixer
1—25 cubic foot Besser Skip Loader
1—Air Offbearing Hoist
1—Gardner-Denver Air Compressor
1—Hyster, Model YT-40 Lift Truck
75—30 Block Steel Racks
2200—Pallets, 13"x18½"—¼" thick
2—Hand Lift Trucks

And numerous unused spare parts. This equipment is a complete efficient block making "package" and is presently in operation and is offered for sale "as is" for $17,000. Inspection invited.

Bowling Green Concrete Products Co.
16th and Railroad, Bowling Green, Ky.
Factory Phone-2220 Office Phone-2296

FOR SALE

1. Nelson Loader—Used—Gas or electric motor can be used—Good condition—on caterpillar $500.00
2. Forty foot Besser Mixer with motor and extra large new gear $600.00
3. Twenty-eight foot Stearns Mixer with motor and extra new large wheel $450.00
4. Three Mercury platform trucks like new—Gas and Electric generator $2000.00 for the three or $800.00 each
5. One Electric platform lift truck—five ton capacity with charger—no batteries—like new $800.00
6. One Bag Cleaner $75.00

F.O.B. Our Block Plant Rochester, N. Y.

SCHAEFER BROS. BUILDERS SUPPLY CO., INC.
1025 Chili Ave. Rochester 11, N. Y.

BLOCK MACHINES FOR SALE

Three Clipper Strippers—Bargain prices. All guaranteed to be in first class condition. Thousands of steel and cast-iron, cored pallets.

UNIVERSAL CONCRETE PIPE CO.
Telephone Main 3313
297 S. High St. Columbus 15, O.

FOR SALE
CONCRETE MIX TRUCKS

1—2 yd. Jaeger mounted on 2-3 ton Mack trk. Serial EH181182. New paint and ready for service. Price $2,000.00
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1—CMC 30 ton hopper with 42 cu. ft. weigh batcher used 3 months. Price $1,500.00
1—New model 19B concrete vibrator serial 624212 Briggs & Stratton gas motor with 24 ft. vibrating shaft complete used ½ hr. Price $200.00

Write:

ABBOTT & BYERS CONTR'S.
518 Monroe Ave. Evansville, Ind.
Phone 4-2391 ask for Byers

FOR SALE
CLARK PLATFORM GASOLINE LIFT TRUCKS

1—3 Ton
1—2 Ton
Both for $950.00
Both in good running order.

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12527 Greenfield Ave.
Detroit 27, Mich.

FREE SERVICE
for BUYERS

Here is the quick way to get information and prices on machinery and equipment. Just check the item (or items) listed below about which you desire information. Then send this page to us, and we will take care of the rest.

TEAR OFF HERE

- Admixtures, Aggregate
- Aftercoolers, Air
- Aggregates (special)
- Air Compressors
- Air Separators
- Asphalt Mixing Plants
- Bagging Machines
- Bags
- Barges
- Batchers
- Belting, Conveyor, Elevator, Power Transmission
- Belting, V-Type
- Belt Repair Equipment
- Bin Level Indicators
- Bins and Batching Equipment
- Blasting Supplies
- Block Machines Concrete Building
- Bodies, Trailer
- Brick Machines and Molds
- Buckets
- Bulldozers
- Cars, Industrial
- Classifiers
- Clutches
- Coal Pulverizing Equipment
- Concentrating Tables
- Concrete Mixers
- Concrete Mixing Plants
- Concrete Specialty Molds
- Concrete Waterproofing and Dampproofing
- Conveyors
- Coolers
- Cranes
- Crushers
- Derricks
- Dewatering Equipment, Sand
- Diesel Engines
- Dragline Cableway Excavators
- Draglines
- Dredge Pumps
- Drilling Accessories
- Drills
- Dryers
- Dust Collecting Equipment & Supplies
- Electric Motors
- Engineering Service, Consulting and Designing
- Explosives & Dynamite
- Fans and Blowers
- Flotation Equipment
- Gasoline Engines
- Gear Reducers
- Generator Sets
- Grinding Media
- Gypsum Plant Machinery
- Hard Surfacing Materials
- Hoists
- Hoppers
- Kilns: Rotary, Shaft, Vertical
- Locomotive
- Lubricants
- Mills
- Pulverizers
- Pumps
- Scales
- Screen Cloth
- Screens
- Scrubbers: Crushed Stone, Gravel
- Shovels, Power
- Speed Reducers
- Tanks, Storage
- Tractors
- Trucks, Industrial
- Trucks, Mixer Body
- Trucks, Motor
- Vibrators
- Welding & Cutting Equipment
- Winches
- Wire Rope

If equipment you are in market for is not listed above, write it in the space below.

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Send to:

Research Service Department

ROCK PRODUCTS

309 W. Jackson Blvd. • Chicago 6, Illinois

Your Name..... Title.....

Firm Name .....

Street .....

City ..... State.....

PLEASE PRINT YOUR NAME AND ADDRESS CP-8

ALSO SEE CLASSIFIED ADVERTISING ON OTHER EQUIPMENT IN ROCK PRODUCTS' GENERAL SECTION

FOR SALE

KORPAK BLOCK MACHINE complete with double 4" and 8" mold boxes and all attachments. Excellent condition. CHAMPION DRAIN TILE MACHINE complete with 6" and 8" attachments. Like new.

MITCHELL CONCRETE PRODUCTS
Incorporated
Mahomet, Illinois

Concrete Block Machine, new, uncrated Besser Multimold plain pallet stripper, with swinging tamper and stripper head combined. Priced for quick sale.

MICHIGAN ROAD MAINTENANCE CO., INCORPORATED
6220 Miller Rd. Dearborn, Mich.
Phone Luzon 1-2560

FOR SALE

6000 lb. Clark Platform Trucklift—good running condition.
4000 lb. Salisbury Turreteer Platform Liftruck (including extra motor).
42" C-C Jeffery Bucket Elevator.
Large size Colorcrete machine.

CONE-CRETE PRODUCTS
1500 W. Bristol St. Elkhart, Indiana

FOR SALE

Portable Barber Greene Transfer conveyor 36 ft. long 24 in. wide belt covered. Built to transfer dry batches from dump truck into transit mixer trucks. Priced to sell. Bought new May, 1948.

FLEGALS READY MIX
R.R. No. 2 Angola, Ind.

FOR SALE

Success Down Face Stripper Block Machine. For 8x8x16 in. Plain blocks; Rock face and Pan blocks. Machine in good working condition. Capacity 8 hrs. day, 600 blocks. Price $800.00.

BABRICK'S BLOCK YD.
214 Ogden St. Washington, Ind.

FOR SALE

Two Appley Block Machines, 8x8x16, used three months, with approximately 2000 aluminum pallets, 1 pallet oil dunker, 1 20-ft. conveyor, 1 three-way hopper, 1 water control unit, 2 extra molds 4x8x16, 2 extra molds 12x8x16, all for $1800.00, delivered anywhere within 2000 miles of Tucson, Arizona. First $870.00 deposit gets all, balance on delivery.

EBB WEBB, 28047 N. First Ave., Tucson, Ariz.

PACKER-HEAD WINGS

McCracken Type — PROVED to last as long or longer — yet cost considerably less. Write for prices.

TEXAS FOUNDRIES
LUFKIN, TEXAS

CEMENT COLORS

CONCRETE BRICK COLORS
CEMENT COLORS
MORTAR COLORS
made by
BLUE RIDGE TALC CO., INC.
Henry, Virginia

CEMENT COLORS—Write for samples and prices of **"LANSCO" CEMENT COLORS** in bright shades of RED, YELLOW, GREEN, BLUE, BLACK, BROWN. Manufactured by

LANDERS-SEGAL COLOR CO.
73 Delevan St. Brooklyn 31, N. Y.

EQUIPMENT WANTED

WANTED

One used Ten Ton Bridge Crane, 30 ft. gauge, 440 volt, 3 phase, 60 cycle motors.

UNION CONCRETE PIPE CO.
Ceredo, W. Va.

PUMICE FOR SALE

IDAHO WHITE PUMICE

A car load or a train load. Our supply is unlimited. (Processed ready to use.) This same pumice used in Blocks to obtain Fire Underwriter's 8-4 approval.

POCATELLO PUMICE COMPANY
231 W. Center St. Pocatello, Idaho
Phone 555

CINDERS FOR SALE

FOR SALE

Crushed and sized cinder aggregate, tested and approved for the manufacture of cinder blocks. Write:

DULUTH CINDER SLAG & STONE CO.
Box 274 Duluth, Minn.

PALLET CLEANER

HAVE YOU SEEN OUR NEW PALLET CLEANER?

AN AUTOMATIC MACHINE FOR REMOVING CONCRETE "BUILD-UP" FROM PLAIN PALLETS. Cleans on 18½x26" Pallet in 12 seconds.
Write for Free Literature

BERGEN MACHINE & TOOL CO., INC.
189 Franklin Ave., Nutley 10, N. J.

—BUSINESS OPPORTUNITIES—

FOR SALE

Block Plant—Year around business—Besser Super Vibrapac equipped. Will sell all or Machinery separate from Real Estate. Retiring—A buy for quick sale. Write Box H-84, Concrete Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FOR SALE

CONCRETE BLOCK PLANT & BUILDERS SUPPLY FOR SALE in the heart of Florida. Growing city located on the highest point in Florida fully equipped and ready to operate. All equipment in class A condition. Appley machines capacity 2000 blocks per day. Will sacrifice due to owner's other interests out of town. **A real bargain.** If you would like to live in Florida and enjoy health and still make a good living write:

ANDERSON CONCRETE PRODUCTS, INC.
Box 468 Lake Wales, Fla.

FOR SALE

Most conveniently located block plant in San Diego. Doing nice business; capacity 60,000 units per month. Must sell a/c health.

P.O. Box 1521 San Diego 12, Calif.

FOR SALE

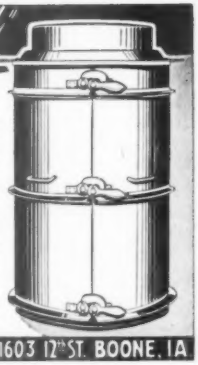
Pumice Block Plant complete, capacity 4,400 blocks per 8 hr. day, near pumice deposit. Price $3900.00. Immediate possession. Owner busy with other interests and wishes to sell at sacrifice.

F. STEFANICH
1933 Farris Ave. Fresno, Calif.

POSITIONS WANTED

I am thoroughly experienced in the manufacturing and marketing of blocks and many other precast products. I gained my experience as owner, not as an employee, therefore can understand the owners viewpoint. I recently sold my plant and will consider managers position on a lease or a profit sharing basis. I am married and in my middle forties. References exchanged. Write Box H-80, Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

THE "Quinn Standard" FOR CONCRETE PIPE



The Quinn Standard is known as the best the world over, wherever concrete pipe is produced and used. Backed by over 35 years' service in the hands of hundreds of Quinn-educated contractors, municipal departments and pipe manufacturers who know from experience that **Quinn pipe forms** and **Quinn mixing formulas** combine to produce the finest concrete pipe at lowest cost.

QUINN HEAVY DUTY PIPE FORMS

For making pipe by hand methods by either the wet or semi-dry processes. Built to give more years of service—sizes for pipe from 10" up to 120" and larger—tongue and groove or bell end pipe at lowest cost.

WRITE TODAY. Complete information, prices, and estimates sent on request.

Also manufacturers QUINN CONCRETE PIPE MACHINES

QUINN WIRE & IRON WORKS 1603 12TH ST. BOONE, IA

CONCRETE BURIAL VAULTS

BERG VAULT SYSTEM

BERG VAULT CO.

1949 Columbia
Block Machine

Controlled Vibration with Synchronized Pressure

Oil Hydraulic

Three Sizes Model 8, 4, 3

Automatic or Semi-Automatic

Plain Pallets

All Regular and Special Blocks

Makes 2-8x8x16 or 3-6x8x16 per pallet

4 Pallets per Minute

Any Type Aggregate

Rugged Construction

Modern Design

Manufactured by

Columbia Machine Works

105 Main Street Vancouver, Washington

the new Centered STIRRUPS AND CHAIRS, WIRE FORM HANGERS for Precast Concrete Joists

• Uniform, Reliable, Trouble-free Stirrups and Chairs for reinforcing and supporting reinforcing bars in Pre-cast concrete joist fabrication.

• #11 guage wire form hangers provide a faster method for installing formwork for concrete slabs over precast joists.

• Stock of all standard sizes for prompt delivery anywhere.

• We will make special Stirrups, Chairs or Wire Form Hangers on request.

Literature, Prices or Samples on Request.

AUTOMATIC SPRING COILING CO.

4049 WEST THORNDALE AVE., CHICAGO 30, ILL.

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"HOW GOOD WERE THE GOOD OLD DAYS?"

In some respects, they were wonderful. In others, terrible. Take that matter of truck mixer sizes and capacities. There was a time when trying to determine true capacity was like looking in a dark room for a black cat that wasn't there.

That's why we formed the Truck Mixer Manufacturers Bureau—to set up standards that would guarantee sizes and capacities, for your convenience.

All you have to do now is look at the Bureau's rating plate on each truck mixer. That's your guarantee of size and capacity . . . your protection against "outlaw" sizes . . . your assurance that you can figure accurately your costs based on truck mixer operation.

So that rating plate does away with a lot of the troubles you used to have in the good old days. We think it does away with a lot of our old troubles, too. We think it helps us in our manufacturing and sales policies, and in our relations with you, our customers.

Yes, the rating plate of the Truck Mixer Manufacturers Bureau is one thing that would have made the good old days even better.

2 CUBIC YARD MIXER
GUARANTEED TO HOLD, MIX AND AGITATE ITS RATED CAPACITIES AND CERTIFIED TO COMPLY WITH TRUCK MIXER MANUFACTURERS BUREAU STANDARDS AS APPROVED BY N.R.M.C.A.
3 CUBIC YARD AGITATOR
N.R.M.C.A. REGISTRY No.

Truck Mixer Manufacturers Bureau

Affiliated with The National Ready Mixed Concrete Association

BLAW-KNOX DIVISION Pittsburgh, Pa.	CONCRETE TRANSPORT MIXER CO. St. Louis, Mo.	WORTHINGTON PUMP AND MACHINERY CORPORATION Ransome Division, Dunellen, N. J.
CHAIN BELT COMPANY Milwaukee, Wis.	THE JAEGER MACHINE COMPANY Columbus, Ohio	THE T. L. SMITH COMPANY Milwaukee, Wis.

a combination that's hard to beat

High Pressure Kiln being loaded with blocks to be cured.

J&C Model "CP" Brick Press

J&C HIGH PRESSURE CURING EQUIPMENT PLUS A J&C BRICK PRESS.

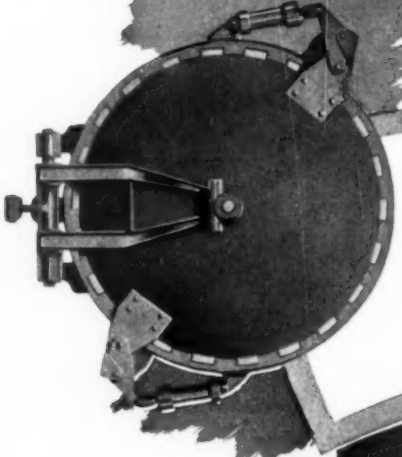
WITH J&C HIGH PRESSURE EQUIPMENT YOU CAN:

- ..get all the shrinkage out of your product down to normal expansion and contraction
- ..do ten years curing in 12 to 15 hours
- ..use less cement for a better product
- ..make today .... sell tomorrow.
- ..reduce costs for handling, storage space and stock pile and save 15 to 25% over all

WITH J&C MODEL "CP" BRICK PRESS YOU CAN:

- ..produce up to 14,000 perfect concrete or sand lime brick per 8 hour shift
- ..apply 75 ton forming pressure to get a clean sharp brick
- ..make better brick ....that lay up faster in a stronger, neater wall
- ..eliminate pallet costs because J&C made bricks need no pallet for handling
- ..modernize your plant, reduce production costs, and have a better product

Try the J&C combination today .... a J&C Model "CP" Brick Press for faster economical production and a J&C High Pressure Curing Kiln for "shrink proofing." Remember .... get the shrinkage out of your brick and block and you'll eliminate cracking walls.



Another J&C "First"!

Hydraulic Kiln Door Cuts Opening and Closing Time by 90%!

New J&C Kiln Door -- Hydraulically opened, closed, and locked.

a product of [illegible]

MADESCO BLOCKS stand the gaff

Protect Your Wire Rope Investment

wire rope blocks

USE GOOD TACKLE BLOCKS — check the age of the blocks you are now using.

Tackle blocks stay around a long time — that's the way we make them. However, sheaves, pins and bushings eventually show signs of wear. All these can affect the life of your wire rope.

MADESCO blocks will extend the life of your wire rope, due to Timken roller bearings, bronze bushings or automatically lubricated sheaves.

MADESCO blocks are made in a complete line to meet every requirement.

Send for complete catalog . . .

MADESCO
TACKLE BLOCK COMPANY
A subsidiary of Nazareth Cement Company

A quarter century of service

EASTON, PENNSYLVANIA

- **HEAVY DUTY MULTI-WALL**

SHIPPING SACKS

- **OPEN-MOUTH VALVE-TYPE**
  PASTED AND SEWN

KRAFT BAG CORPORATION

630 FIFTH AVE.
NEW YORK 20, N.Y.
MILLS AT GILMAN, VT.

It stands the gaff!

No matter how tough the screening job, HENDRICK PERFORATED METAL PLATE can be relied on to maintain uniformity of mesh under the hardest kind of usage. For especially tough jobs it is heat-treated to increase its resistance to abrasion. Ideal for vibrating and shaking screens, it is furnished either flat or corrugated.

Not only does HENDRICK PERFORATED METAL PLATE give unusually long service, but it also saves time and money by minimizing clogging. Easy changing of decks cuts down labor costs. Write for full information.

Other Hendrick products include Elevator Buckets of all types; Mitco Open Steel Flooring, Mitco Shur-Site Treads, and Armorgrids; and light and heavy steel plate construction.

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Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
Armorgrids

HENDRICK

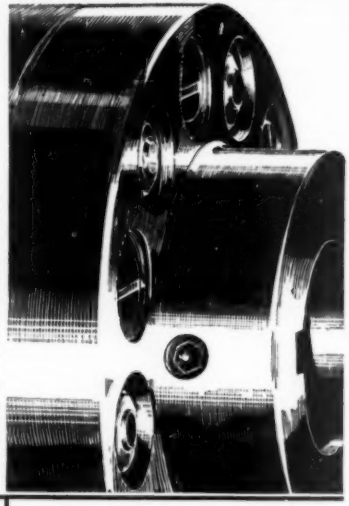
Manufacturing Company

47 DUNDAFF STREET, CARBONDALE, PENNA.

Sales Offices In Principal Cities

Ajax design permits installation vertically or horizontally. No lubrication.

Remember that all the horsepower goes through the coupling... put it up to Ajax.

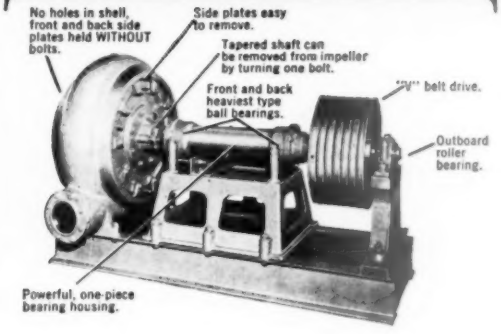


AJAX

FLEXIBLE COUPLINGS

AJAX FLEXIBLE COUPLING CO., INC.
116 PORTAGE RD.
WESTFIELD, NEW YORK

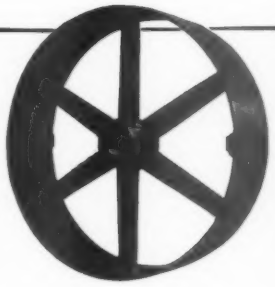
Simplified Parts—Sturdy Design


No holes in shell, front and back side plates held WITHOUT bolts.
Side plates easy to remove.
Tapered shaft can be removed from impeller by turning one bolt.
Front and back heaviest type ball bearings.
"V" belt drive.
Outboard roller bearing.
Powerful, one-piece bearing housing.

A heavy-duty pump, with design so simple even a layman could disassemble and reassemble it without use of special tools. Replacement parts made to jig standards. Write for complete literature and specifications.

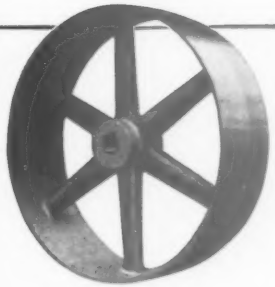
THE KANSAS CITY HAY PRESS CO.
801 Woodswether Road Kansas City, Mo.

The Lightning
SAND & GRAVEL PUMPS

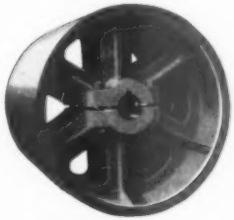


Completely split pulley

High test cast iron pulleys in all sizes and types



Single arm solid pulley

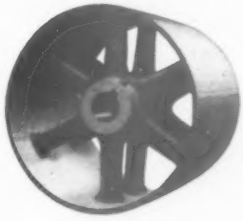


Extra heavy conveyor pulley

JONES cast iron pulleys are true running — they permit higher speeds — no bushings and they can't fall apart — they don't rattle and they look better on most machines.

These pulleys are machine molded, poured of high test cast iron, and are accurately finished and balanced. Multiple piece pulleys, rubber covered pulleys and flywheels can be furnished.

W. A. JONES FOUNDRY & MACHINE CO.
4447 Roosevelt Road, Chicago, Illinois



Double arm pulley

Jones

HERRINGBONE — WORM — SPUR — GEAR SPEED REDUCERS • PULLEYS
CUT AND MOLDED TOOTH GEARS • V-BELT SHEAVES • ANTI-FRICTION
PILLOW BLOCKS • FRICTION CLUTCHES • TRANSMISSION APPLIANCES

THE 1/3 YARD SCHIELD BANTAM

TRUCK MOUNTED POWER SHOVEL • TRENCH HOE
DRAGLINE • CLAM • PILE DRIVER • CRANE

drive up and dig in...

The BANTAM mounts on any 1½ ton truck. It's a fast hard worker on the job and saves time between jobs. Changing from shovel to trench hoe, dragline, clam, piledriver or crane is a matter of minutes.

Its full circle design and fast cycle operation results in capacities of 60 yards per hour as shovel or dragline. When used as a trench hoe it digs 100 feet of five foot ditch per hour.

All major assemblies roll on ball bearings, mechanical clutches are external expanding type, split type laggings provide proper line speeds. Hook roller design eliminates strain on center pin.

For mobility, versatility, easy operation, and capacity for getting jobs done profitably GET A BANTAM. Write for details.

DRAGLINE OPERATION

TRENCHING WITH "MOLES PAW"

SCHIELD BANTAM CO. INC.
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Let Powerful

"BRANFORD" Pneumatic Vibrators

Increase Your Material Handling Efficiency

Install "Branford" vibrators to promote free flow where arching and hanging-up of materials occurs in hoppers, bins, chutes and screens.

They save their cost in very short time in increased production and elimination of damage to equipment by sledging.

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Available in sizes to suit any requirement. Write for catalog

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NEW HAVEN VIBRATOR CO.

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GAYCO Centrifugal Air Separator

The features embodied in the new model GAYCO Centrifugal Air Separator make them a leading means of increasing the capacity and efficiency of all types of grinding mills. They have quick, positive adjustment. When once adjusted they are not affected by variation in speed or rate of feed.

They require very little power to operate. And they feature the exclusive GAYCO principle of rejecting coarse particles by means of a centrifugal sizing fan. They separate 99% through 325 mesh, and give 35% to 30% greater recovery of fines.

● Manufacturers also of "Reliance" Crushers, Screens, Elevators, Conveyors, Bin Gates, Grizzlies. Complete crushing, screening, and washing plants for crushed stone, sand and gravel.

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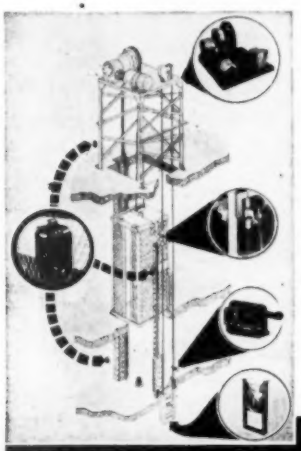
EHRSAM ELECTRIC MANLIFTS



Rapid, inter-floor transportation for your employees means more productive time. More production means more profit. Illustrated here is the electric operated, cage-type manlift made in 300 lb. and 500 lb. capacity. Other types available. Reasonable installation costs bring you real savings. Write today for complete information.

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HAYWARD BUCKETS

WON'T QUIT OR CAUSE TIME OUT

A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

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WOVEN WIRE SCREENS

ACCURATE • DURABLE • ECONOMICAL

The reliability of T.C. Alloy Screens has carried them into all parts of the world. Made in Standard and Special Weaves, with Square or Oblong Openings — from 10 mesh, .035" wire on up. Write today for Catalog No. 42.

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New Leader *Super Deluxe*
LIME AND ROCK SPREADER

The most advanced spreader on the market. Spreads lime, sand, chips, gravel . . . hauls and self-unloads all types of construction materials including crushed rock. Reinforced welded steel frame, wooden hopper, new simplified worm gear drive direct from truck power take-off. Mounts on any standard truck chassis.

Write for illustrated literature.

New swinging endgate. Distributor discs easily and quickly removed.

HIGHWAY EQUIPMENT COMPANY, INC.
604 D. Avenue N.W. Cedar Rapids, Iowa
Manufacturers of the World's Most Complete Line of Spreaders

BIN-LEVEL CONTROLS

2 BIN-DICATORS
Often Replace 1 Man

BIN-FLO
Aerating Units
Keep Things Moving

ECONOMICAL MATERIAL CONTROL

DEPENDABLE BIN-LEVEL INDICATION

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THE BIN-DICATOR CO., 13946 Kercheval, Detroit 15, Mich.

Please send new 20-page catalog giving complete information and specifications on BIN-DICATORS. Also please send information on BIN-FLO Aerating Units.

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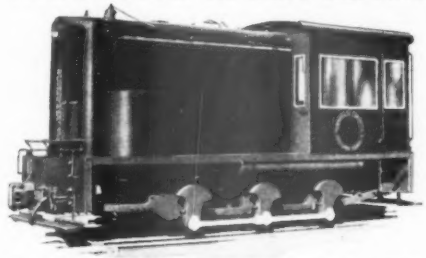
FITTED POWER for BEST RESULTS



Cia de Cemento Portland "Diamante," Bogota, Columbia, S. A. employ this 25-Ton, 0-6-0 Davenport Diesel Mechanical Locomotive, equipped with Caterpillar D-17,000 Engine.

Better-Built DAVENPORTS are AVAILABLE in STEAM GASOLINE DIESEL with ELECTRIC or MECHANICAL DRIVE
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Every rail operation is different! Length and frequency of trips; grades, curves, condition of rails; condition and kind of cars; size of loads—all these are pertinent and can lead to but one conclusion: For best results, your haulage power unit should be FITTED to your particular haulage operation.
Our engineers will be glad to receive a description of YOUR haulage conditions and submit reliable, money saving recommendations. No obligation.

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A DIVISION OF DAVENPORT BESLER CORP.
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HOW TO SELECT A CLAMSHELL BUCKET

For best performance be sure to check

- Crane Capacity
- Work To Be Done
- Clearances
- Bucket Type and Size

Determine *closing line pull*; also *size* of closing and holding cables · *Allowable gross load* is the closing line pull or safe working gross load, whichever is less · Consider *headroom clearance* and any other *space limitations* · Determine *character of material* to be handled · Then select the *type, size* and *weight* of bucket and the proper *accessories* to make the bucket adaptable to your operations. For complete details, send for Bulletin 2076.

BLAW-KNOX DIVISION of BLAW-KNOX COMPANY
2035 Farmers Bank Bldg., Pittsburgh 22, Pa.

BLAW-KNOX CLAMSHELL BUCKETS
THE MOST COMPLETE RANGE OF SIZES AND TYPES

L-O-N-G-E-R SERVICE LIFE IS SOLD WITH EVERY Owen Bucket

Grit-proof bearings for Alemite lubricated center shaft minimize wear on hinge castings. Wide bearing surfaces also reduce wear and assure permanent shell alignment.

Owen hinge stop design holds bottom sheave block upright and broad counterweight is shaped to protect cables and sheaves from contact with abrasive materials. Yes, Longer Service Life is sold with Every Owen Bucket.

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A MOUTHFUL AT EVERY BITE

ARMSTRONG-BRAY
GEAR and WHEEL PULLERS

These powerful service tools Pull gears, wheels, bearings and bushings from shafts, easily and quickly. They eliminate pounding, battering and breakage of vital machine parts. They make tedious and risky jobs fast and safe. They usually pay for themselves in the first job, and give years of satisfying service.

12 types, 40 sizes (including special designs for special application) with drop forged arms and heat treated forcing screws.

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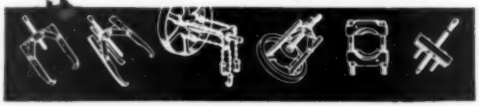

PERFORATED METAL SAND AND GRAVEL SCREENS

Manufactured exactly to your specifications

Any size or style screen, in thickness of steel wanted with any size perforation desired.

We can promptly duplicate your present screens at lowest prices

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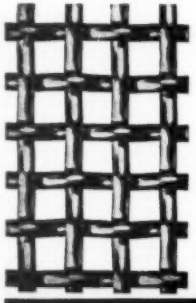

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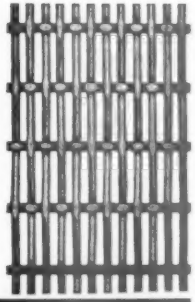
WOVEN WIRE SCREENS

For Accuracy, Capacity and Durability

TYLER SCREEN SECTIONS FOR ALL MAKES OF SCREENING MACHINES



THE W. S. TYLER COMPANY, CLEVELAND 14, OHIO

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1—30-ton Plymouth Std. Ga. Gasoline Locomotive. New 1943.
6—500 cu. ft. I.R. and Chgo. Diesel Compressors.
1—¾ yd. KNIT Crane and Dragline Model 514.
1—⅜ yd. Link Belt Model 75 Gas Shovel and Crane.
1—1½ yd. Northwest No. 6 Diesel Shovel.
1—80D Northwest Diesel Shovel.
1—1½ yd. Koehring Model 604 S&C.
2—10-ton American Terry all steel Stiffleg Derricks.
1—30-ton Ohio Diesel Locomotive Crane. New 1946.
1—D7 Tractor w/cable Blade DDPCU. 9T Series.

B. M. WEISS COMPANY
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FOR SALE

One Model 75C Haiss Loader, Serial No. PM387 with LeRoi power unit, Serial No. 237647. Purchased New September, 1948. Condition like new. Bargain.

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Phone Dial 5-4833

FOR SALE

2 Fairbanks Morse 6 cyl. Diesel Engines, Model 35 HE 8-8x10½.
1 Allis Chalmers Generator. 438 KVA. 526 AMPS 60 CY 3 PH 125 Volts 900 RPM. Complete with panels.

UNITED PRODUCTS CO., INC.
Rock River, Wyo.

FOR SALE

2—1942 Jaeger 3 yd. mixers on 1940 Brockway Trucks. $1500 each. Good condition.

CRAWFORDSVILLE READY-MIX CONCRETE COMPANY
Box 208 Crawfordsville, Ind.

ATTENTION: CONTRACTORS!

MARION No. 111M 3 yard DIESEL SHOVEL new in 1947. BYERS No. 83 ¾ yard DIESEL SHOVEL new in 1948. FOR RENT OR SALE. VERY REASONABLE TERMS. Box H-86, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

USED EQUIPMENT EXCELLENT CONDITION

2—Diamond 32x27 Hammermills at $2700.00 each
2—Diamond 40x36 Hammermills at $3000.00 each
1—Diamond 15x36 Roller Bearing Jaw Crusher at $4800.00
1—Diamond 10x20 Plain Bearing Jaw Crusher at $2050.00
1—Diamond 10x20 Roller Bearing Jaw Crusher at $2300.00
1—Diamond 28 ft. Bucket Elevator, Folding Type, with 10"x6"x7¾" Buckets Mounted upon Steel Truck with Steel Wheels. Also 36" Dia. x 15' Revolving screen for Bin Mounting with ¼", ½" and 1" Punched plate. No Drives, Power Unit or Crusher Included. However, truck has provision for Mounting Crusher and Power Unit. Total at $2650.00
2—Diamond Steel Truck with 8" Channel Frame and Plain Bearing Steel Wheels suitable for Mounting 10x20 and smaller size crusher at $300.00 Each
1—10x40 Roller Bearing Jaw Crusher at $1835.00
1—Diamond 30"x5' Double Eccentric Plate Feeder with Jaw Clutch at $600.00
1—Set of Diamond Anti-Friction Bearing Machinery for 30" Belt Conveyor 101 ft. to 150 ft. centers at $480.00
1—Scrubber Section Revolving Type 36" dia. x 7 ft. length at $660.00
All Prices FOB Minneapolis—Net Subject Prior Sales

DIAMOND IRON WORKS, INC.
1728 Second St., N. Tel. CHerry 4421
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SHOVEL, CRANE & CLAMSHELL

1—BUCYRUS-ERIE, Model 20B, Combination Shovel, Crane and Clamshell, 35' Boom, powered with a Caterpillar D4600 Diesel Engine, Serial No. 15203. In excellent condition and ready to go to work.

1—BUCYRUS-ERIE, Model 10B, Combination Shovel, Crane and Clamshell. Powered with a Buda Gasoline Engine. Excellent condition and ready to go to work.

FURNIVAL MACHINERY CO.
54th & Lancaster Ave., Phila. 31, Pa.

FOR SALE

Four (4) 8'3"x45'11" Efficient Multi-tube Indirect Rotary Coolers by Traylor for Lime and Alumina Oxide.

THOMAS M. BROWN
1315 Oliver Bldg.—Pittsburgh, Pa.

1—Pair Rolls, Allis-Chalmers 40"x 15", Anaconda, rebuilt and Rebabbitted.
1—No. 6 Traylor Gyratory Crusher with T.Z. head.
1—No. 4½ Traylor Gyr. Crusher.
1—Jeffrey Swing Hammer Mill, Type A, 30"x24".
1—18" Link-Belt Apron Conveyor—9" pitch, 27' centers, like new.
1—American 66"x35 ft. Rotary Dryer with burner, stack and drive.
Bucket Elevators, open and totally enclosed, new and used, as is or rebuilt.

JOHNSON & HOEHLER, INC.
P.O. Box 102 Lansdowne, Pa.

NOTICE OF SALE OF GRAVEL PLANT MACHINERY AND EQUIPMENT

NOTICE is hereby given that sealed bids will be received at the office of Herbert P. Wilson, Secretary of the Board of Commissioners of the Metropolitan Airport Authority of Rock Island County, Illinois, 501 Cleaveland Building, Rock Island, Illinois on or before the *20th* day of *August*, 1949 at the hour of 1:00 o'clock P.M., and to be opened at the last mentioned time and date and heard at public meeting of the Commissioners of said Authority, to be held in the Managers Office in the Administration Building of the Quad-City Airport, Moline, Illinois, for the purchase of the following machinery and equipment formerly owned by the Schadt Service Company and used by said Company in the operation of a sand and gravel plant, just West of the Quad-City Airport, on the South side of Route Ninety-two (92) acquired by said Authority in condemnation proceedings:

ITEM		DESCRIPTION
1	1	Cummings Diesel Engine 150 H.P., Eng. No. 15673, 1200 R.P.M. Model H.P. equipped with Twin Disc Clutch and 10 inch 10 belt, "V" pulley.
2	1	"Exide"—12 Volt, 168 Amp. Hr. Battery.
3	2	"Grant"—6 Volt, 109 Amp. Batteries, Model 15-C.I.
4	1	Set Head Gaskets for Cummings Diesel Engine.
5	2	Fan Belts for Cummings Diesel Engine.
6	1	2-Drum American Hoist Width of drums 2'-3" Diameter of drums 2'-0" with 36" diameter "V" pulley for 10 belts. (Hoist and Diesel engine are mounted as one unit but may be separated.)
7	10	C-180B "V" Belts for Diesel Engine and Hoist.
8	1	Fairbanks-Morse Induction Motor, 50 H.P., Type "B" 440 Volt, 900 R.P.M., 60 cycle, 3 phase No. 30214. (This motor is for use with the American Hoist.)
9	1	Set of silent gears and chain for use with American Hoist. Large chain gear 1'5" diameter, 3-⅜" Shaft, 8" face. Small gear, 4-⅛" diameter for 2-⅜" shaft, 8" face. 1—Silent chain, for the above gears.
10	3	Westinghouse Style 997554 G., 20 H.P.-60 Amp.-575 Volt Safety Switches.
11	2	G.E. Starting Compensator, Catalog No. 2619014 G, 7 20/25 H.P. 440 Volt, 60 cycle, 3 phase.
12	1	Trumbull Electric Company double throw enclosed safety switch Catalog No. 35354—200 Amp. 3 Phase, 500 volt.
13	1	Fairbanks-Morse Induction Motor Starter No. 59018, 15/20 H.P. 440 Volts, 60 cycle, 3 phase.
14	1	Safety Switch 2 pole, 30 Amp. 125 Volts, Cutler-Hammer.
15	1	Trumbull Electric Company, 30 Amp. 250 Volt, 2 pole type "C" Electric Switch, Cat. No. 40221.
16	1	Sorgel Electric Company Transformer 3-KVA, 460-230 Volt, 60 cycle, 230/115 Volts on Sec. Single Phase, Type "S."
17	1	Trumbull Electric Company, 60 Amp., 250 Volt, 3 Pole Enclosed Electric Switch, Catalog No. 13656.
18	1	Air Compressor by Auto Compressor Company of Wilmington, Ohio, with ¾ H.P. Wagner Electric Motor, Single Phase, 60 Cycle, 1725 R.P.M., 110-220 Volt.
19	1	Fairbanks—35 ton Truck Scale, including all beams, weghts, and deck, No. 190925.
20	1	Square D Single Throw Fused Bottom Safety Switch, 100 amp. 500 Volts.
21	1	4" Union Steam Pump Company, 400 G.P.M., 1800 R.P.M., 100 ft. head, No. 189922 Water Pump with Century Squirrel Cage Induction Motor, Type "SC," 3 Phase, 60 Cycle, 1735 R.P.M.-15 H.P. 440 Volts, Serial No. 991799.
22	1	Steel Sauerman Mast Pole 80' High, with 15 foot extension complete with guy cables, sheaves, with approximately 2550 feet 1-⅛" used cable, 750 feet—⅝" cable and 300 feet ⅝" cable.
23	1	Universal Stone Crusher Company, Cedar Rapids Crusher No. 2.
24	1	¾-yard Sauerman Bucket with Chains and Blocks.
25	1	Diamond Double Deck Screen with 20 H.P., G.E. Induction Motor, Type 5013Y-440 Volt, 24 Amp. No. 4836841 60 cycle, 3 phase and 1 Linkbelt Vibrating Screen 3'x5', Type N P-135 (this screen is mounted above the Diamond screen, but is not connected to power).
26	1	2-compartment Butler Bin 9'x15' mounted on top of tower.
27	1	Telsmith Tank on chutes.
28	1	Storage Shed with miscellaneous parts, bins.
29		Miscellaneous pipe for wash water and sand discharge with steel "A" frame for discharge pipe, including miscellaneous valves and fittings.
30	1	Used P&H Crawler type Cat Wagon.

Conditions of Sale:

For further information and permission to examine equipment or machinery contact the Manager of the Quad-City Airport at the Administration Building of said Airport.
All machinery and equipment to be removed within thirty (30) days of sale at the sole expense of the purchaser.
All bids should be made by reference to above Item Number. Bids will also be received for all of said machinery and equipment in one lump sum.
All bids should be addressed to Herbert P. Wilson, Secretary of the Metropolitan Airport Authority, 501 Cleaveland Building, Rock Island, Illinois or presented personally.
All bids are payable in cash at the time bid is accepted by the Board of Commissioners of said Authority.
Said Board of Commissioners of said Authority reserve to themselves the right to accept or reject any or all bids for the equipment or machinery as they deem best for the interests of said Authority.

LESLIE C. JOHNSON
Chairman of the Board of Commissioners — Metropolitan Airport Authority of Rock Island County, Illinois

FOR SALE

100-Late Model Cranes

Reconditioned (like new)

Link Belt ½ yd.	$4500.00
Insley ½ yd.	4500.00
P&H ½ yd.	4500.00
Osgood ½ yd.	4500.00
Byers ½ yd.	4000.00
P&H ¾ yd.	7500.00
Marion w/shovel ¾ yd.	9000.00
Buckeye w/shovel ¾ yd.	6000.00
Quickway Truck Crane	6000.00

Many others (as is) at low prices.

ELLIS-NOVACK COMPANY
2510 W. Empire Ave. Burbank, Calif.
Charleston 8-1641

READY MIXED CONCRETE PLANT

1—Complete READY MIXED CONCRETE PLANT—Blaw Knox Including the following: 800 barrel bulk cement bin, 100 ton per hour bucket elevator with unloading screw for handling bulk cement; Model 84-S Ransome Mixer (less than 2 years old); 100 ton three compartment aggregate bin complete with cement and aggregate weighing batchers; electric powered gantry and whirley for charging bins, with 2 cu. yd. Clamshell Bucket. Plant in daily operation and can be inspected in the Philadelphia district. Available on or before September 1, 1949. Offered subject to prior sale or commitment.

FURNIVAL MACHINERY CO.
54th & Lancaster Ave., Phila. 31, Pa.

SCALES — CRUSHERS
VIBRATING SCREENS
CONVEYORS — FEEDERS
CONVEYOR IDLERS

TRUCK SCALES

15 Ton Truck Scales $450.00
20 Ton Truck Scales 510.00
26 Ton Truck Scales 565.00

Other scales to 50 ton capacity. All scales complete with structural steel weighbridge. Replacement parts for most all makes of scales.

STONE, COAL, CINDER CRUSHERS

10 to 20 tons per hour capacity $395.00
25 to 50 tons per hour capacity 945.00

FEEDERS

15 to 35 ton capacity (per hr. of 50 lb./cu. ft. mat.) $150.00
28 to 60 ton capacity (per hr. of 50 lb./cu. ft. mat.) 190.00
50 to 100 ton capacity (per hr. of 50 lb./cu. ft. mat.) 575.00
100 to 175 ton capacity (per hr. of 50 lb./cu. ft. mat.) 800.00

VIBRATING SCREENS

We have approximately 100 machines on the floor, ranging in screening area sizes from 2'x5' to 5'x14' with 1 to 5 decks. Eccentric weight or positive throw eccentric shaft types.

Prices range from $395.00

CONVEYORS — PICKING TABLES

Troughing—Idler conveyors—picking tables—Lengths from 10' to 500', widths to 60".

Prices range from $395.00

TROUGHING and PICKING TABLE IDLERS

All steel construction. Interchangeable with other well-known makes of idlers. Precision ball bearings with alemite fittings. Bearings are replaceable. Shafts run clear through, and no bearing adjustments are required. Easy to start and will run in cold weather. No grease seals. Rust-proof ball races; maintenance is negligible. If you want to build your own conveyors we have all parts including standard sections, head and tail pulleys, takeups, drives, idlers, speed reducers, sheaves, belting, etc.

3-roll Idlers

Width			
14" belt	$18.50	24" belt	$21.00
16" belt	19.00	30" belt	22.00
18" belt	20.00	36" belt	23.00
		42" belt	24.00

1-roll Idlers

Width			
24" belt	$ 8.25	36" belt	$ 9.75
30" belt	9.00	42" belt	10.50
		48" belt	11.25

More than 2000 mines and quarries have Bonded equipment. Send for catalog and prices of new and rebuilt machines. Guaranteed equipment—immediate shipment from large stocks at reduced prices.

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225 HP Busch Sulzer diesel generating set. 150 KW AC. Complete. Modern.

30 ton Whitcomb diesel mechanical locomotive. New in 1943.

1½ yard Lima 601 diesel crane and shovel combination.

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IN GOOD USED CONDITION AT FRACTION OF NEW PRICE

MODELS 150-A and CH 150.....$175.00 to $435.00 EACH

SPECIAL ITEMS WHILE THEY LAST

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500'—30" belt conveyors, roller bearing idlers
300'—24" belt conveyors, ball bearing idlers
400'—36" belt conveyors, roller bearing idlers
18" and 20" flat conveyors, roller bearings
42" belt conveyors
18" belt conveyor with plain bearings
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Pulleys, belt idlers and belt
Portable belt conveyor, 18"x24', 5 hp. motor
Portable belt conveyor, 10"x10' with 3 hp. motor
New slat conveyor, 48"x105'
Steel Apron Feeders, 18", 24" and 30" wide
24" and 20" belt trippers
Single Strand Flight conveyor, 15"x150'
4 Jeffrey No. 4 vibrating feeders with 30 amp. controller

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Farrel Jaw crusher, 10"x16", Blake A
Climax 10"x20" Jaw crusher
No. 16-40 Gruendler Aristocrat Peerless Grinder
Double roll crusher, 18"x28", corrugated
American Pulverizer, type 8T-T
A.C. 3D. gyratory reduction crusher, short head
Jeffrey 30"x24" Hammermill, "A"
Farrell 1-C Laboratory Crusher
Sturtevant No. 2 Sample Grinder
Gruendler Lime Pulverizer 3XB

VIBRATING SCREENS

Seco vibrating screen, 4'x16', two deck
Pioneer 4 deck vibrating screen, 4'x8'
Tyler electric type 400, single deck, 4'x8'
Seco vibrating screen, 3'x8' two deck
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New Universal vibrating screens

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20' overhead Maris 3 motor 10 ton electric crane
Lakewood material bucket 1½ yard cap.
Electric Hoisting engines
Sullivan two drum air hoist, cap. 2,000 lbs.
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40' slings of ¾" galv. wire rope—new

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Enclosed 40' elevator, 14" buckets
Enclosed 20' elevator, 5" buckets
Enclosed 15' elevator, 4" buckets
Enclosed 35' elevator, 8" buckets
Enclosed 50' elevator, 12" buckets
Open 50' elevator, 12" buckets
Open 40' elevator, 10" buckets
Open 30' elevator, 8" buckets
Inclined belt elevator, 10" buckets, 40'C
Enclosed Spaced bucket elevator, 10"x40'
Inclined and vertical elevators, 14" buckets
Inclined or vertical 12" spaced bucket elevators
Elevator belt, buckets, chain, sprockets, pulleys
Chains: C188, C131, C111, C110, C102B, C102½, 83, 825, 822, 811, 522, 520, 1030, etc.
Will furnish spaced or continuous bucket elevators

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Following two items practically new:

1—100 ft. Pioneer Conveyor with 30" Belt complete with V Belt Drive and 7½ H.P. motor. Only used 4 months—f.o.b. Wapakoneta—without motor—$3000.00; with motor—$3150.00.

1—Morrow Model 60 Sand Drag complete with drive. In very good condition. Capacity approx. 35 tons per hour. F.O.B. Wapakoneta....$450.00

Subject to prior sale.

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Wapakoneta, Ohio
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1—22B Bucyrus-Erie Shovel
1—15B Bucyrus-Erie Shovel
1—Buckeye 70 Clipper Shovel
1—Parmanco Drill
1—Quincy 85 ft. compressor, mounted on model B Allis-Chalmers tractor
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1—Ingersoll-Rand 55 lb. jackhammer

All in nearly new condition. No war surplus.

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A-C gyratory crushers, 30"—20"—16".
Rotary dryers-kilns, 5½'x50', 6x50, 6'4"x140'.
C P T air compressor, 1574', diesel, 300 HP.
Whitcomb 7-ton gas locomotive, 36" ga., rebuilt.
Porter, Vulcan 18-ton steam locos., 36" ga.
Locomotives, diesel, gas, 5 to 30 tons.
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Gas, Diesel Steam Loco. Dump Cars, Loco Cranes.
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Rod Mills—Gyratory Crushers, Roll Crushers, Jaw Crushers 10"x36", 15"x36", 18"x36", 20"x36", 24"x36", 36"x42", 42"x60", some portable some with feeders, Cone Crushers 3' and 4', Screens, Feeders, Wemco & Door Classifiers, Jigs, Pumps, Deep Well Pumps, Tuggers, Mine Hoists, Motors, Transformers, Conveyors, Portable Gravel Plants, Road Rollers, Wagon Drills, Blast Hole Drills.
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Each Unit Overhauled
K-55 Link Belt Electric Shovel
2 yd. Shovel and Dragline Front
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5' Dia. x 8' Air Swept Tube Mill
Complete with Motors, Fans and Pipe

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1—Motor Generator to operate the above Hummer screens, 4-FC KVA 4, duty const, RPM 850, volts 220, 60 cycle, 3 phase, manufactured by Reliance Mfg. Co. of Cleveland, Ohio. $500.00 f.o.b. truck or car—our plant at Frederick, Md.

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1—Sullivan 7-B1 "Super" Shortwall Undercutter; 220 volt D.C. 50 H.P., 30' No. 2 parallel duplex twisted 2 conductor cable, one 9½" bar, one 8' bar, water tank for water on bar, 6" kerf, "V" type chain lacing, 6" per min. feed, 9 position bar, Shop No. 12406, S.T. 16001, Motor No. 848, 3 cutter chains SK10232, cutter bar XA14180 Cm, No. 13376 fast feed gears, No. 13375 intermediate gear, No. 6315-EL armature shaft, and 10,000 Cincinnati duplex cutter bits.

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Model No. 4, 50' boom. Very good working condition and appearance. Presently working on large project in New York City. Price—$4,500.00.

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Also one Davey 105 compressor.

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FOR SALE: Complete Sauerman Cableway outfit for sand and gravel plant, consisting of: 80' structural steel, self-aligning mast, 20' sections, with six 1⅛" guy cables; 1 cu. yd. cableway bucket with 3 wheel carrier; 675' of 1¼" track cable, with tension blocks and sheaves; 85 HP Waukesha gas engine on double drum Sauerman hoist, 2 speeds on front drum, 800' of ⅝" Fad cable just new. Spare parts. Priced as a unit. Avail. immediately and ready for service. **Price reduced if taken soon.**
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CARLYLE RUBBER PRODUCTS ARE NEW, GUARANTEED & LOW PRICED

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ABRASIVE RESISTANT COVERS

Width	Ply	Top-Bottom Covers	Width	Ply	Top-Bottom Covers
48"	8	1/8" — 1/16"	24"	4	1/8" — 1/32"
42"	5	1/8" — 1/16"	20"	5	1/8" — 1/32"
36"	6	1/8" — 1/16"	20"	4	1/8" — 1/32"
30"	6	1/8" — 1/16"	18"	4	1/8" — 1/32"
30"	5	1/8" — 1/16"	16"	4	1/8" — 1/32"
26"	5	1/8" — 1/32"	14"	4	1/16" — 1/32"
24"	5	1/8" — 1/32"	12"	4	1/16" — 1/32"

Inquire For Prices — Mention Size and Lengths

TRANSMISSION BELTING

HEAVY-DUTY FRICTION SURFACE

	Width	Ply	Width	Ply	Width	Ply
Inquire For Prices — Mention Size and Lengths.	18"	6	10"	6	6"	5
	16"	6	10"	5	5"	5
	14"	6	8"	6	4"	5
	12"	6	8"	5	4"	4
	12"	5	6"	6	3"	4

ENDLESS "V" BELTS

"A" Width All Sizes —
"B" Width All Sizes —
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Sold in Matched Sets.
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SPECIAL OFFER . . . HEAVY DUTY RUBBER HOSE

FIRE HOSE

APPROVED SPECIFICATION HOSE EACH LENGTH WITH COUPLINGS ATTACHED

I.D. Size	Length	Per Length
2½"	50 feet	$28.00
	25 "	16.00
2"	50 "	23.00
	25 "	13.00
1½"	50 "	20.00
	25 "	11.00

Specify Thread On Couplings

AIR HOSE

I.D. Size	Length	per Length	Universal Couplings
½"	25 feet	$5.00	$1.50 Pair
	50 "	10.00	1.50 Pair
¾"	25 "	7.50	1.50 Pair
	50 "	15.00	1.50 Pair
1"	25 "	10.00	1.50 Pair
	50 "	20.00	1.50 Pair

LARGER SIZES ALSO AVAILABLE
All Prices—Net — F.O.B. New York

WATER HOSE

I.D. Size	Length	per Length	I.D. Size	Length	per Length
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	50 "	8.00		40 "	12.00
1"	25 "	6.25		50 "	15.00
	50 "	12.50	1½"	25 "	10.00
1¼"	25 "	7.50		35 "	14.00
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Each Length with Couplings Attached

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1—One half yard drag line bucket, good condition.

1—(56) Fifty six ft. belt conveyor frame with (6) six inch idlers, speed reducer, and enough 24" belt for same.

1—Bucket conveyor 70' (seventy feet) high, malleable buckets on chain spaced 24" geared speed reducer powered by 7½ H.P. motor 60 cycle 3 phase, complete with starting switch.

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Tubular Piling, Points, Sleeves and Cobi Pile Tips
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Supplies of Fittings, Valves and Tube Turns
Pipe—Small and Large Diameters, Iron and Steel, Welded, Seamless, Corrugated

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Buc-Erie 200B Elec. Shovel, 6 yd.
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P&H 1055 Dragline, Diesel, 90' boom. NEW.
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Manitowoc Diesel 3000B Standard Shovel.
P&H 1225 2½ yd. Full electric shovel.
Ind. Brownhoist 25 ton Low. Crane. Diesel.
American 25 Ton Locomotive Diesel Powered.

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Cedar Rapids 20x36, 25x40.
Farrell 10x20, 13x30, 14x38, 42x40.
Buchanan 36x42. Type C.
Pioneer 24x36 portable with feeder and conveyor.
Traylor 18x36, 24x36.
Austin Western 25x40.
Allis Chalmers 30x18.
Good Roads 10x30.
Telsmith 18x32.
Champion 1030, 1040 and No. 6.
Gyratory: Allis Chalmers-McCully, 6", 7½", 8", 9", 12K, 20", 30"
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Telsmith 5H, 10-B, 13-B, 16-B.
Kennedy Van Saun 7, 19, 25½-S, 38.
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Roll: Allis-Chalmers 54x24, Diamond 40x22, Pioneer 30x18, Telsmith 24x16, McLanahan & Stone 18x42, New Holland 24x16.
Hammer Mill: Slac 4 Williams Jumbo, Pennsylvania SX2, 22x22, Cedar Rapids 20x32, Jeffrey 36x42, Jeffrey 30x24, 30x40 Dixie.
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Rod Mill: March 2'x8', 3'x8', Allis Chalmers 4'x8' Hardinge No. R 206.
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4 Jaeger 6 yd. agitators on Int. K-11-F.
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I-R 1500 CFM, 100 psi. Electric Drive.
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Penna. 1300 cfm Direct Connected; elec.
New Penna. 900 cfm; synchronous motor
C.P.T.C 985 cfm; V-belt drive; elec.

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I-R "Quarrymaster" drill Cap. 6"x70'.
Loomis 6" blast hole, gas, self-propelled.
Keystone Model 51 Vertical. Complete. Excellent.

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2 Cat. D8, Series 2U-2700 angle dozer DDPCU.
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Cat. D7 Series 3T Cable controlled dozer.
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Int. TD-18 Trail Builder angle bulldozer.
Cat. D4 with T6 tractavator 1 yd. bucket.

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Butler 300 ton 2 compartment aggregate each compt. 400 bbl. cement complete with elevator, scales, etc.
Johnson 600 yd. complete plant with 8 compt. bin and two Smith 2 yd. mixers. Used four weeks only.
3 Mixer Mobile units: 1 Tower Mobile.
Heltzel 100 ton 3 compartment aggregate bin.
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B-G Model 848 Bit. Concrete Mixing.
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Pioneer 154V Crushing and Screening, complete.
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Cedar Rapids Two unit mobile crushing.
Cedar Rapids Model AAA Crushing.

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8 Koppel 5 yd. 36" Ga. Dump Cars.
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O.E. 45 ton Diesel-Elec., std. ga.
Davenport 45 ton Diesel-Elec., std. ga.
Vulcan 12 ton gas, std. ga.
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Baldwin 50 ton Steam Std. Ga.
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Lambert 25 ton Guy derrick 115' bm.
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Motors and Generators, A.C. and D.C., for sale at Attractive Prices. Large Stock. New and Rebuilt. All fully guaranteed. Send us your inquiries.

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Price $2500.00 complete f.o.b. cars.

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Price $1200.00 complete f.o.b. cars.

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Price $1400.00 f.o.b. cars.

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Price $900.00 f.o.b. cars.

1—18x24 McLANAHAN DOUBLE ROLL STONE CRUSHER, 1 belt pulley, 20 to 50 tons per hour.
Price $900.00 f.o.b. cars.

1—18x32 ACME JAW CRUSHER, steel plate frame.
Price $1200.00 f.o.b. cars.

1—10x20 ACME STEEL JAW CRUSHER.
Price $400.00 f.o.b. cars.

1—Columbus Conveyor Co. Paddle Type LOG WASHER, 2 sets paddles mounted on square shafts, bevel gear drive, steel tank, 15 ft. long.
Price $600.00 f.o.b. cars.

1—Columbus Conveyor Co. Paddle Type LOG WASHER, 2 sets paddles mounted on square shafts, bevel gear drive, steel tank, 8 ft. long.
Price $400.00 f.o.b. cars.

1—International TD-9 TRAC-TRACTOR mounted with Hughes-Keenan Highlift, with hydraulic dozer blade and 1 yard bucket attachments.
Price $2000.00.

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20 tons Belgian flint pebbles
1—American pulverizer with 125 H.P. direct connected motor
1—70 H.P. Marine type diesel engine, same as new
All steel dredge boats, tug boats and pug boat
Electric motors AC from 1 H.P. to 300 H.P.
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1—10'x150' Kiln
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Steel buildings: 20'x100', 75'x350' and 50'x350'.
One industrial property in desirable location, water power, railroad and highways and excellent labor conditions. Also lake frontage on many desirable lakes.

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20-A Telsmith Primary Crusher with motor and drive.
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OFFERED AT A SUBSTANTIAL DISCOUNT

NEW COAL HANDLING PLANT

150 ton per hour, Jeffrey, complete with crushers, conveyors, hoppers, feeders to handle run of mine bituminous coal.

NEW COAL PULVERIZERS

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All above equipment manufactured 1947-1948.

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Crushing Rolls—12"x12" up to 54"x24".
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Lime hydrating plant.
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1—9'x170' Kiln.

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1—Plymouth Locomotive.
2—Easton Side Dump Cars.
1—Northwest 25 ¾ Yard Dragline.
1—Link-Belt LS8 Backhoe.
1—K11 International Tractor.
1—30 Ton Trailer.
1—McMyler Steam Locomotive Crane.
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SHOVEL: Bucyrus-Erie 54-B, 2½ yd., DI7000 caterpillar motor.
DRILLS: Bucyrus-Erie 29-T, gas, 9" bits, NEW. 2—Electric, used.
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GOODRICH SUPER LONG LIFE CORD CONVEYOR BELT (NEW): Large quantity 42" wide, 6 ply, 42 oz. duck, 7/32" top cover, 1/16" bottom cover, on original reels, all NEW, NATURAL RUBBER with or without mech. parts.
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JAW CRUSHERS: Sizes 4x6 to 48x60".
CONE CRUSHER: Symons 5½ ft. short head.
REDUCTION CRUSHERS: Traylor type TZ, size 36"; Kennedy model 37 with motor integral; Telsmith 32-B, V-belt pulley; type R322 fine reduction; Traylor type TY, 1'8".
HARDINGE MILLS: 6'x36" silex lined; 8'x20" and 10'x72" steel lined with or without motors. 8'x20" and 8'x30", manganese steel lined, Herringbone gears, with motors and V-belt drive.
KILNS, COOLERS, DRYERS: 1—Single shell 34"x20', complete with drive, burner; no motor. 1—5'x50' brick lined kiln. 1—10'x90' heavy duty type Dryer complete with dust collector and all auxiliary equipment. 1—Ruggles-Coles Double shell, class XF-12, 80"x60"; Traylor Single shell 60"x40' with or without motors.
MINE HOISTS: 1—All steel single drum 8' dia., 1½" rope, 64,000 lbs. single line pull, 600 FPM, 400 H.P., 2200 volts, A.C., control equipment. 1—250 H.P. single drum, 7'3"x5', 30,000 lbs. single line pull, 750 FPM complete. 1—200 H.P., single drum, 42" face, 60" dia., A.C., 2200 volts and controls. 1—150 H.P., double drum, 38" dia., 42" face, 440 volt, A.C., complete with controls.

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4 and 5 Ton Yard Cranes on R. T. Wheels.
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Compeb mills: 6′ and 7′ dia.

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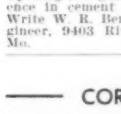

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JAW TYPE: 24x36, 25x40, 22x50, 30x42, 40x48 42x48, 48x60 and smaller sizes to 7x9.
REDUCTION TYPE: 2, 3, 4 and 5½ ft. Symons Cone; Nos. 19, 25, 37 and 38 Kennedy; 36″ Traylor TZ, 1′8″x2′4″ TY; No. 36 Telsmith Gyrasphere; 7, 10, 14″ Newhouse; Stedman 30 and 36″ Impact.
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MILLS: Hardinge 3′x8″, 6′x22″, 6′x3′, 8′x8′ & 8′x4′; Kennedy 4x8, 5x6, 5x11; Marcy 4x5, 6x14; Smidth 16B Tube Mills; Raymond 4 & 5 Roller Mills; Bonnot, Fuller, Sturtevant & others.
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Barges, Bins, Buckets, Boilers, Cableways, Cars, Compressors, Conveyors, Cranes, Dryer, Derricks, Elevators, Excavators, Generators, Hoists, Kiln, Draglines, Drag Scrapers, Dredges, Drills, Engines, Locomotives, Loaders, Motors, Pipe, Pumps, Rail, Scales, Screens, Stacklines, Shovels, Tanks, Trucks, Tractors, Etc., in many sizes, types and makes at low prices. (I have equipment at many points in the United States and Canada. What you need may be near your plant.)

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RENT apply purchase price

20″x36″ EAGLE R.B. overhead eccentric Jaw Crusher, especially long jaws. Weight 26,000 lbs. NEW Orig. cost $8400.00—Would rent responsible party $400.00 per month with purchase option on $6800.00—This also includes a home made Feeder for shovel loading, which operates good. 4′x10′ 2-deck SIMPLICITY Vibr. Screen model BG. Weight 5400 lb. with screen sections. BRAND NEW 25% off reg. factory price. $1550. THEW-LORAIN No. 55 1 cu. yd. Shovel. Rebuilt. $4500.00—Rent $400.00 monthly. Excellent for quarry.
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INTERNATIONAL TD-9 with Bucyrus-Erie Front end Loader. Two years old. Good. $3250.00.

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and many other quarry and mine products, too

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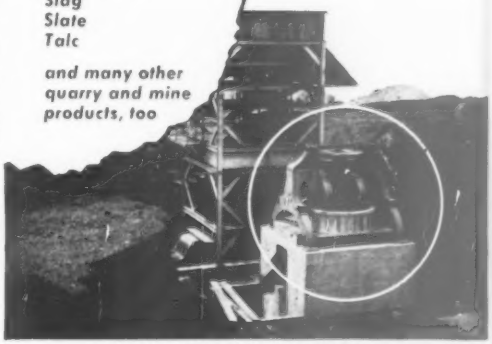
GROUND



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What material do you grind? Chances are that one of the 8 sizes of "American" Grinders can deliver the VOLUME you need . . . in the SIZE you require . . . at a LOWER COST that will impress you.

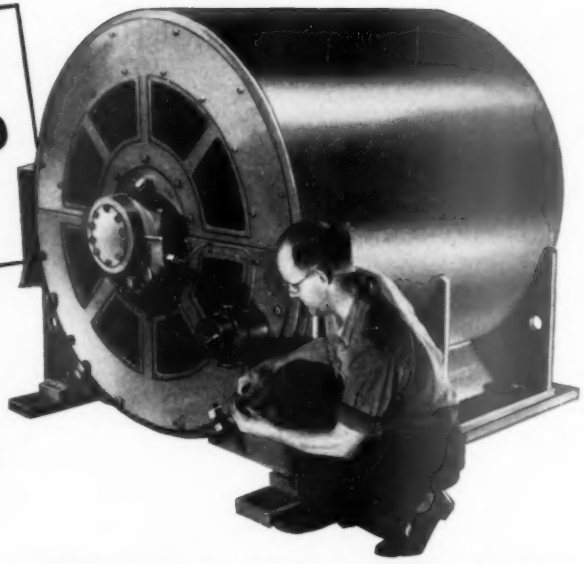
If your product is of the type suggested by the list above . . . let an "American" grinding specialist help you lick your problems once and for all. Write, wire, phone.

To suggest rate of output . . . "American" Grinders produce minus ¾" aggregate ground CINDER and clinker volume at these rates:

Grinder No.	5	6	7	8	9	482	418	384
Yds. per Hour	4	6	12	20	30	35	50	75

American by
THE W. A. RIDDELL CORP.
BUCYRUS, OHIO

TUBE-TYPE
TOTALLY-ENCLOSED FAN-COOLED MOTORS!

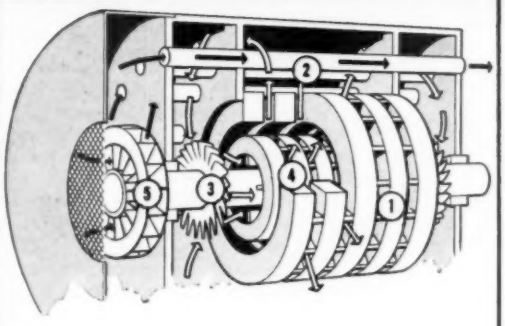


DIRT-

AND CORROSION-RESISTANT!

PROOF!

How Tube Cooling Works



Stator core (1) is surrounded by tubes (2). Internal fans (3) circulate air through ducts (4) in rotor and stator and around tubes, transferring heat to tubes.

External fan (5) drives outside air through tubes, removing heat and keeping tubes clean. All electrical parts are enclosed. Dirt cannot enter.

*Totally-Enclosed Fan Cooled

- **Install anywhere – indoors or out**
- **Heat exchanger is practically *self-cleaning***
- **Sizes . . . 75 to several thousand horsepower**

THIS ALLIS-CHALMERS tube-type TEFC* motor practically eliminates cleaning and other high maintenance costs associated with large motors exposed to dirty and corrosive atmospheres. And it does this with a simple, self-contained, tube-type, ventilating system.

All electrical parts — including the stator core — are enclosed. The simple heat transfer system keeps temperatures well within rated limits. Cleaning is rarely needed because air passages are unrestricted. Air flow through the straight tubes removes foreign matter.

Three years of field operation have proved important savings. Sizes from 75 hp and up. Also explosion-proof designs. For complete information, outline your requirements to your A-C Sales Office, or write for Bulletins 05B7150 and 51R7149.

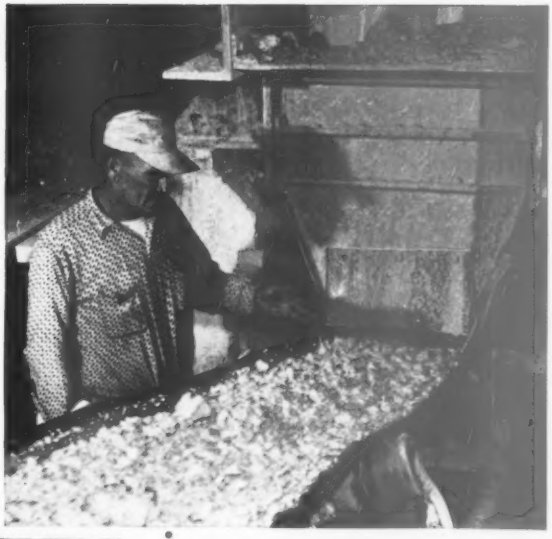
A 2664

ALLIS-CHALMERS, 975A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

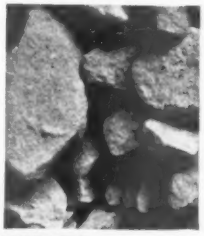
Dual Impact Action does it again!

And again! And again!



In Ohio limestone...

Tom Hudson, owner Hudson Stone Products Company, Lynchburg, Ohio, says, "A one-crusher plant can be successfully built around this crusher . . . (a New Holland Model 3030)." Important: Breaking force evenly distributed assures accurate sizing without irregular shapes.



....In Florida coral

"We are handling a very abrasive coral rock . . . breaking it down to minus one inch," reports G. D. Monroe, president of the Miami Crushed Stone Company. Note: Tough to handle. Yet a single New Holland 3030 Double Impeller Breaker is *doing the work of three previous crushers.*

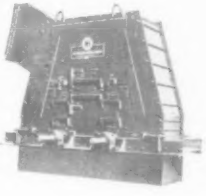
.....In Oregon gravel

"We have never found rock in the pit that could not be crushed," says Les Gibson of Canby Sand and Gravel, Canby, Oregon. "It is my sincere conviction that this crusher (New Holland Model 2020) will operate at a cost of ⅓—¼ that of a conventional rock crushing plant."

Right—for every rock

Owners everywhere are chalking up records with New Holland Double Impeller Breakers, (four different models) . . . turning out top tonnage in coral, limestone, gravel, all types of rock . . . making top profits.

New Holland Double Impeller Breakers are built to take it—and break it—day in—day out. Heavy duty steel wear plates. All parts accessible. All adjustments easily made. Mounted on I-beams to simplify installation. Minimum power required . . . maximum output assured.



SEE FOR YOURSELF. Pick your spot—and take a look. But first—write for information including distributor. Address Department 8000.

NEW HOLLAND DOUBLE IMPELLER BREAKERS

NEW HOLLAND MANUFACTURING COMPANY, MOUNTVILLE, PA.

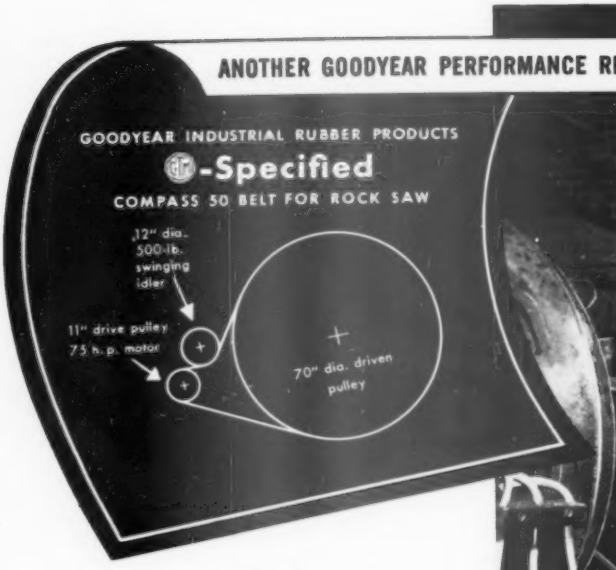
Affiliate of The Sperry Corp.

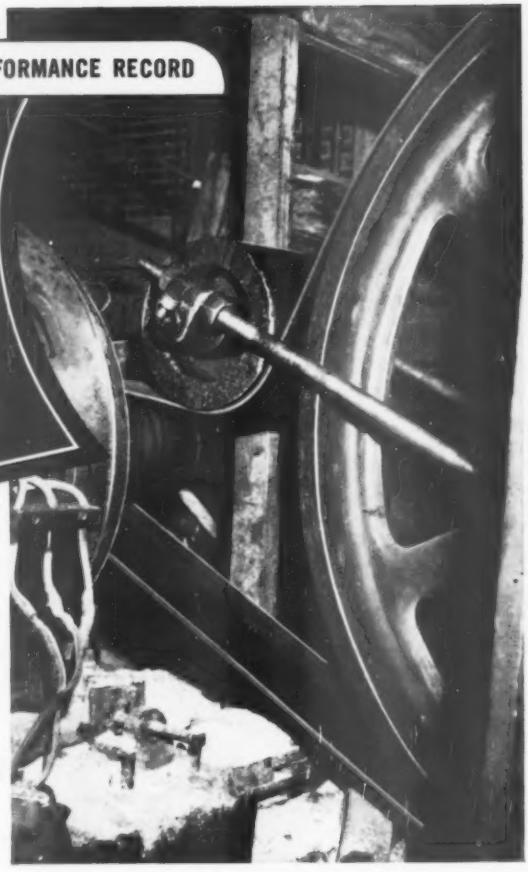
ANOTHER GOODYEAR PERFORMANCE RECORD

GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GT-Specified

COMPASS 50 BELT FOR ROCK SAW





Four times the belt life at one-quarter lower cost

A CAROLINA quarry used to have plenty of trouble with their rock gang saw, driven by a conventional transmission belt. Operating on the reciprocal principle, every backstroke of the saw causes a slack in the drive belt. Then down comes a 500-pound idler—literally pounding the life out of ordinary belts in short order.

Plagued by frequent belt failures the operator called in the G.T.M. —Goodyear Technical Man. He recommended installation of Goodyear's COMPASS 50 belt. The COMPASS 50 was installed—*ran for two and a half years*—four times as long as the best previous belt record on this drive! *And the cost of the COMPASS was 25% less!*

Savings in over-all belt cost, reduced downtime, and lower repair bills all come naturally to COMPASS users. For this patented, exclusive Goodyear construction puts sinewy endless cords into the load-carrying section of the belt, and builds the belt truly endless without a weakening splice. That means COMPASS belts have practically zero stretch — more strength to handle heavy shock loads and overloads — much longer on-the-job life.

Ask the G.T.M. to show you how COMPASS belts can answer your power transmission problems. Or write Goodyear, Akron 16, Ohio.

FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING *built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.*

GOODYEAR

THE GREATEST NAME IN RUBBER

Compass—T.M. The Goodyear Tire & Rubber Company